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CCP Transuranic Waste Characterization Quality Assurance Project Plan

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

A INTRODUCTION

The Central Characterization Project (CCP) is tasked with characterizing and certifying transuranic (TRU) waste for disposal at the Waste Isolation Pilot Plant (WIPP). Characterization consists of radiography; visual examination (VE); headspace gas sampling and analyses; and totals sampling and analyses; as applicable for the waste stream.

This Quality Assurance Project Plan (QAPjP) describes how the waste characterization and certification activities performed by the CCP comply with the *Waste Isolation Pilot Plant Hazardous Waste Facility Permit* (HWFP), Attachment B - B6, Waste Analysis Plan (WAP) (New Mexico Environment Department [NMED] 1999). This QAPjP also implements the applicable quality requirements of the Department of Energy-Carlsbad Field Office (DOE-CBFO) *Quality Assurance Program Document* (QAPD) (DOE 1999a). The format of this QAPjP parallels that of the WAP.

A-1 Background

The WAP is organized such that it specifies that the generator/storage sites (hereinafter referred to as “sites”) conduct their own TRU waste characterization and certification, including their own data generation level and project level data validation and verification. However, some sites (typically small quantity sites) do not have the resources necessary to characterize and certify their TRU waste. Additionally, other sites have expressed interest in using subcontractors to augment their existing capabilities. The CCP was established to assist these sites as well as to provide cost-effective TRU waste characterization, confirmation, and certification, including data generation level and project level data validation and verification.

The CCP may provide its services to a site by contracting directly with that site. If this is the case, the scope of services provided by CCP are specified in a Statement of Work (SOW) issued by the site. The SOW also specifies health and safety requirements, quality requirements, and other requirements specific to that site. A site-specific interface document may also be prepared which provides more detail on the site-CCP interface.

The site has general management oversight responsibility for work performed by the CCP at the site. The site is responsible for ensuring that CCP conducts its activities in compliance with site requirements.

A-2 Scope

This QAPjP specifies quality requirements, management activities, and procedures necessary to meet the specific data quality objectives (DQO) for TRU waste characterization as defined in the WAP and QAPD. Only TRU waste that has been characterized and certified in accordance with the WAP is shipped to the WIPP facility. TRU waste characterization and certification activities conducted by the CCP are performed in accordance with the requirements and implementing procedures identified in this QAPjP. In some cases, some characterization or certification activities are shared between the CCP and the host site. The applicable implementing site documentation is specified in a SOW and supplemented by a site interface document, if required.

The WAP also specifies that the final verification of TRU waste characterization and certification data are done at the Permittee level. Personnel within the CCP do not participate in the Permittee level verification process.

This QAPjP meets WAP characterization and certification requirements for contact-handled TRU waste. As used in this document, the term TRU waste includes TRU and TRU-mixed wastes. Further, the term “characterization” is used where applicable to indicate the entire characterization process. Additionally, the WAP allows waste streams to be divided into waste stream lots. Therefore, the term waste stream may be used to indicate waste stream lots.

A-3 Project Description

Consistent with requirements in the WAP, CCP uses acceptable knowledge (AK) to initially characterize TRU waste. Section B4 of this QAPjP outlines the process used to characterize TRU waste using AK. AK documentation provides the basis for identifying the TRU waste eligible for WIPP disposal. The characterization process is based on the following:

- Waste considered for characterization is defense-related and has a TRU alpha activity greater than 100 nanocuries (nCi) per gram (g)
- Resource Conservation and Recovery Act (RCRA) hazardous waste determinations are made initially using AK for TRU waste streams
- Radiography and VE, as required, are used to document and verify AK-based waste matrix code assignments, to verify the physical form of the waste, and to verify the absence of prohibited items

AK information for each waste stream is compiled in AK reports and supporting documentation. Based on AK, waste streams are delineated according to Summary Category Group, and waste matrix codes are assigned to each waste stream.

The CCP evaluates the characterization necessary to certify a particular waste stream. If additional characterization is needed to supplement site capabilities the CCP uses mobile characterization facilities to perform characterization activities. Mobile characterization support is provided in accordance with this QAPjP. The CCP has the option to use data or transportation services from established TRU waste characterization activities at a DOE-CBFO-certified site.

A-4 Central Characterization Project Organization and Responsibilities

The CCP organization is shown in Figure A-1 and responsibilities are described in the following sections. Figure A-1 includes generic CCP positions. More specific positions are described in the SOW or site interface plan.

A-4a Central Characterization Project (CCP) Manager

The CCP Project Manager is responsible for the day-to-day management and direction of CCP activities related to the characterization, certification, and disposal of TRU waste for DOE-CBFO. The CCP Project Manager is responsible for the following:

- Ensuring successful CCP/site interface
- Ensuring CCP plans and operations are coordinated, integrated, and consistent with DOE-CBFO programs, policies, and guidance
- Coordinating CCP activities and functioning as principal point of contact with DOE-CBFO and other regulating agencies
- Reviewing and approving this QAPjP

A-4b Site Project Manager

The Site Project Manager (SPM) and the Deputy SPMs oversee TRU waste characterization and certification activities and are responsible for the following:

- Developing, maintaining, reviewing, approving, and implementing CCP procedures and plans
- Scheduling revisions and distribution of CCP procedures and plans and forwarding these documents (if significantly revised) to DOE-CBFO for review and approval before implementation
- Reviewing and approving site interface documents (if used)
- Participating in internal audits and assessments
- Assisting the Site Project Quality Assurance Officer (SPQAO) in developing project assessment criteria and responses to deficiency reports
- Halting characterization or certification activities if problems affecting the quality of the certification or work processes exist
- Ensuring CCP personnel receive appropriate training and orientation and maintain proficiency in work assignments
- Evaluating AK reports
- Reconciling AK information with characterization data
- Reconciling verified data with DQOs
- Ensuring that conditions adverse to quality are resolved and that corrective actions are implemented in a timely manner
- Assigning additional Environmental Protection Agency (EPA) Hazardous Waste Codes to TRU waste on the basis of analytical results with concurrence from the site, as applicable

- Preparing and submitting SPM Data Validation Summaries, Waste Stream Profile Forms (WSPFs), Characterization Information Summaries, and Waste Stream Characterization Packages (if requested by DOE-CBFO)

- Reviewing semi-annual QA/QC summary reports and forwarding them and comments to the DOE-CBFO

A-4c Site Project Quality Assurance Officer

The SPQAO and the Deputy SPQAOs provide QA oversight and planning for the CCP and oversees the implementation of the QA requirements of this QAPjP. To perform the necessary responsibilities, the SPQAO has direct access to responsible management at a level where appropriate action can be taken. The SPQAO reports to the CCP Manager. The CCP QA program is coordinated with the WIPP site QA program as described in CCP-PO-002, *CCP Transuranic Waste Certification Plan*. QA issues that cannot be resolved by the SPQAO are elevated to the CCP manager. The SPQAO is sufficiently independent of cost and schedule to perform the assigned responsibilities. Specific responsibilities include the following:

- Reviewing, approving, and implementing CCP procedures and plans including this QAPjP

- Tracking compliance and evaluating trends with QA objectives described in this QAPjP

- Reviewing and approving supplier and subcontractor QA plans

- Providing guidance to all CCP organizations concerning identification, control, and protection of QA records

- Coordinating and participating in internal and external audits and assessments to verify compliance

- Verifying and validating characterization data

- Tracking non-conformances and corrective action

- Stopping work if quality is not assured or controlled

- Providing day-to-day guidance on quality related matters to project staff

- Coordinating responses to deficiency reports, such as corrective action reports generated by the DOE-CBFO
- Ensuring conditions adverse to quality are tracked and resolved, and corrective actions are implemented and verified in a timely manner
- Preparing SPQAO Summaries
- Submitting semi-annual QA/QC summary reports to the SPM and DOE-CBFO
- Comparing VE and radiography data and calculating miscertification rates

The facility QA officers implement the QA program at remote sites and perform the data generation level QA officer reviews of Batch Data Reports.

A-4d Waste Certification Official

The Waste Certification Official (WCO) certifies that all data and information necessary to document that all TRU waste payload containers prepared for shipment to WIPP meet all specified criteria. Specific duties and responsibilities of the WCO include the following:

- Certifying that waste packages and waste shipments meet the WIPP-WAC requirements
- Reviewing the applicable CCP plans and procedures and any other waste certification-related documents
- Interfacing with the SPM, Transportation Certification Official (TCO), and SPQAO on matters related to waste certification
- Reviewing, approving, and maintaining CCP-PO-002, CCP Transuranic Waste Certification Plan
- Assisting with the site interface documents
- Ensuring that certification data entered into the WWIS are accurate and demonstrate that waste is acceptable for disposal at WIPP

- Stopping certification activities if problems affecting the quality of certification processes or work products exist

- Assisting the SPQAO with preparation of responses to deficiency reports, as appropriate

A-4e Transportation Certification Official

The TCO) documents and certifies that payload containers and assemblies to be transported in Nuclear Regulatory Commission (NRC) authorized packagings used by the CCP meet the applicable requirements of their respective authorized methods for payload control, *CCP TRUPACT-II Authorized Methods for Payload Control* (CCP TRAMPAC, CCP-PO-003). Specific responsibilities of the TCO include the following:

- Reviewing the applicable CCP transportation plans and transportation procedures and other waste certification documents

- Interfacing with the SPM, WCO, and SPQAO on matters associated with waste transportation

- Reviewing, and maintaining the CCP TRAMPAC

- Preparing, with assistance from the SPM, site interface documents

- Ensuring that data used in completion of the transportation documents are accurate and demonstrate that the waste is acceptable for transportation

- Authorizing Payload Container Transportation Certification Documents

- Authorizing Payload Assembly Transportation Certification Documents

- Assisting SPQAO with preparation of responses to deficiency reports in transportation matters

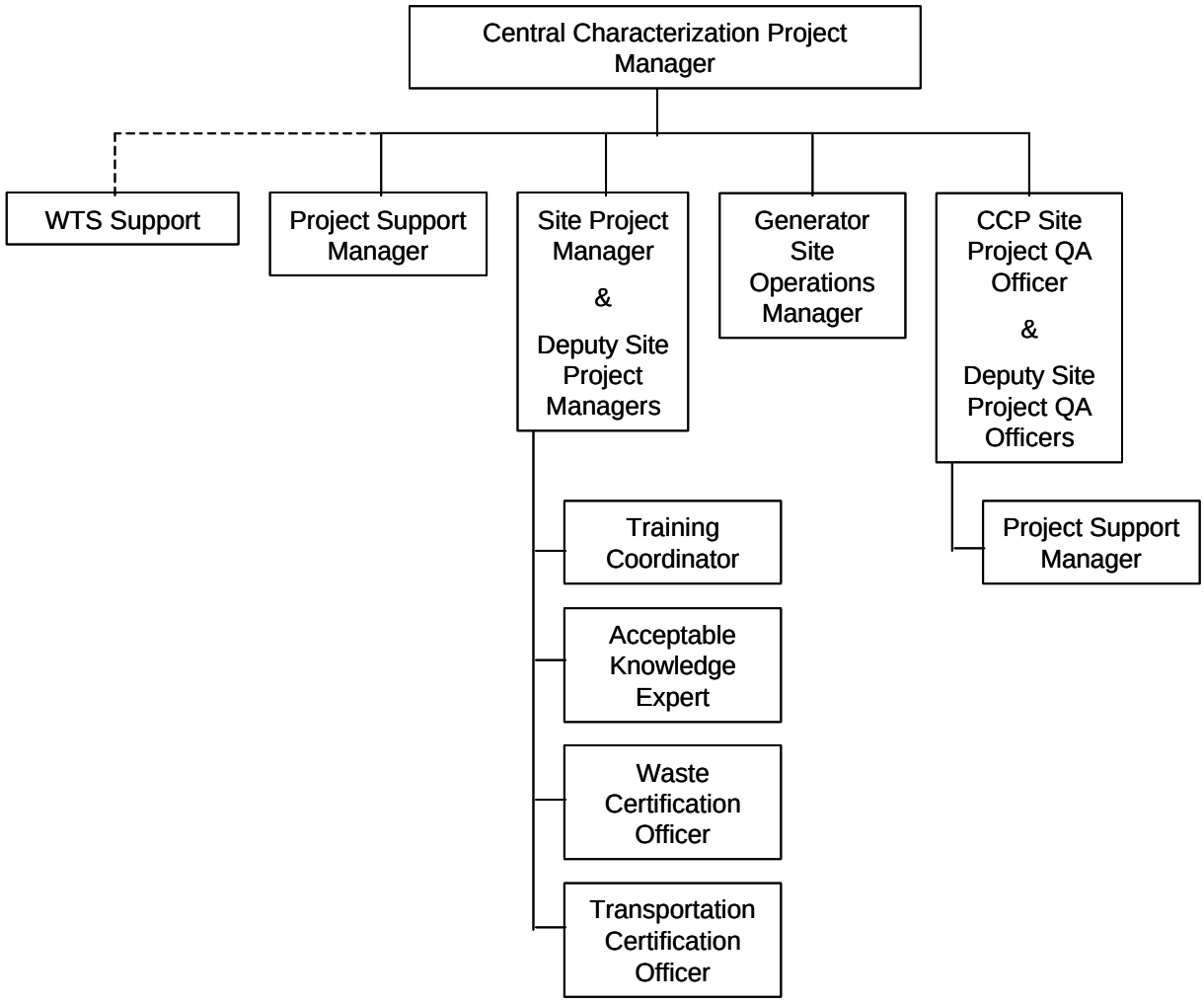
- Ensuring that the transportation data entered into the WWIS are accurate and demonstrate that waste is acceptable for disposal at WIPP

- Halting transportation certification activities if problems affecting the certification or work process exist

A-5 Indoctrination and Training

CCP personnel are qualified and trained according to specifications established in the CCP-QP-002, *CCP Training and Qualification Plan*. Training requirements for specific characterization activities personnel are described in this QAPjP and the CCP-QP-002, *CCP Training and Qualification Plan*.

Figure A-1 CCP Organization



B WASTE ANALYSIS PLAN

Introduction and Attachment Highlights

This QAPjP has been prepared for waste characterization activities to be conducted to meet requirements set forth in 20.4.1.500 New Mexico Administrative Code (NMAC) (incorporating 40 Code of Federal Regulation (CFR) §264.13) for waste disposal at the WIPP. This QAPjP includes test methods, details of planned waste sampling and analysis, and a description of the QA/QC program. Before the CCP offers waste for shipment to the WIPP, the CCP implements the applicable requirements of this QAPjP.

TRU waste contains TRU radioactive components and may contain hazardous components, as defined in 20.4.1.800 (incorporating 40 CFR, §268.35(d)), and in the Federal Facility Compliance Act, Public Law 102- 386, Title 1, §3021(d). TRU waste is designated and separately packaged as either contact-handled (**CH**) or remote-handled (**RH**), based on the radiological dose rate at the surface of the waste container. RH TRU mixed wastes are not characterized under this QAPjP.

The hazardous components of the TRU mixed waste to be managed at the WIPP facility are designated in the Permittees' RCRA Part A Permit Application (Permit Attachment O). Some of the waste is also identified by unique state Hazardous Waste Codes and is certified by the CCP if it meets the conditions of the WIPP's Part B Permit, Module II.C.3 (NMED, 1999).

The CCP has developed this QAPjP to comply with the requirements of the WAP for characterizing CH TRU wastes. The hazardous components of the TRU waste disposed at the WIPP facility are described on a waste stream profile form (WSPF) for each waste stream in accordance with CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*. TRU waste that may be certified by the CCP are or were generated at DOE facilities by defense activities, including the following:

- Production of nuclear products
- Plutonium recovery
- Research and development
- Decontamination and decommissioning

Some TRU waste is retrievably stored at the DOE sites. Additional TRU waste is generated and packaged into containers at these sites. Retrievably stored waste is defined as TRU waste generated after 1970 and before NMED notifies the Permittees, by approval of the final audit report, that the characterization requirements of the WAP at a site have been implemented. Newly-generated waste is defined as TRU waste generated after NMED approves the final audit report for a site. Retrievably stored TRU waste is

characterized on an ongoing basis, as the waste is retrieved. Newly generated TRU waste is characterized as it is generated. Waste characterization requirements for retrievably stored and newly generated TRU wastes differ, as discussed in Sections B-3d(1) and B-3d(2).

Characterization requirements for individual containers of TRU waste are specified on a waste stream basis. The WAP defines a waste stream as waste material generated from a single process or from an activity that is similar in material, physical form, and hazardous constituents. Waste streams are grouped by waste matrix code groups related to the physical and chemical properties of the waste (DOE 1995b). The CCP uses the characterization techniques described in this QAPjP to assign the appropriate waste matrix code groups for the waste. The waste matrix code groups are solidified inorganics, solidified organics, salt waste, soils, lead/cadmium metal, inorganic nonmetal waste, combustible waste, graphite, filters, heterogeneous debris waste, and uncategorized metal. Waste matrix code groups are grouped into three Summary Category Groups: Homogeneous Solids (Summary Category Group S3000), Soil/Gravel (Summary Category Group S4000), and Debris Waste (Summary Category Group S5000).

TRU wastes are initially categorized into the three broad Summary Category Groups that are related to the final physical form of the wastes. Waste characterization requirements for these groups are specified separately in Section B-2. Each of the three groups is described below.

S3000 - Homogeneous Solids

Homogeneous solids, or solid process residues, are defined as solid materials, excluding soil, that do not meet the NMED criteria for classification as debris (20.4.1.800 NMAC (incorporating 40 CFR §268.2[g] and [h])). Included in the series of solid process residues are inorganic process residues, inorganic sludges, salt waste, and pyrochemical salt waste. Other waste streams are included in this Summary Category Group based on the specific waste stream types and final waste form. This Summary Category Group is expected to contain toxic metals and spent solvents. This category includes wastes that are at least 50 percent by volume solid process residues.

S4000 - Soils/Gravel

This Summary Category Group includes S4000 waste streams that are at least 50 percent by volume soil/gravel. This Summary Category Group is expected to contain toxic metals. Soils/gravel are further categorized by the amount of debris included in the matrix.

S5000 - Debris Wastes

This Summary Category Group includes heterogenous waste that is at least 50 percent by volume materials that meet the criteria specified in 20.4.1.800 (incorporating 40 CFR §268.2 (g)). Debris means solid material exceeding a 2.36 inch (in.) (60 millimeter) particle size that is intended for disposal and that is:

1. a manufactured object, or
2. plant or animal matter, or
3. natural geologic material.

Particles smaller than 2.36 inches in size may be considered debris if the debris is a manufactured object and if it is not a particle of S3000 or S4000 material.

If a waste does not include at least 50 percent of any given category by volume, characterization is performed using the waste characterization process required for the category constituting the greatest volume of waste for that waste stream (see Section B-3d).

All waste characterization activities specified in this QAPjP are carried out at sites in accordance with this QAPjP. Waste characterization activities conducted by the CCP include the following, though not all of the activities are performed on each container, as discussed in Section B-3:

- Radiography, an X-ray technique used to determine the physical contents of containers
- VE of the contents of opened containers as an alternative method to determine physical contents or verify radiography results
- Headspace gas sampling and analysis to determine VOC content of gases in waste container void volumes
- Sampling and analysis of waste forms that are homogeneous and can be representatively sampled to determine concentrations of hazardous waste constituents and toxicity characteristic contaminants of waste in containers
- Compilation of AK documentation into an auditable record

Once the required waste characterization is complete, the CCP completes the WSPF to document the results of characterization activities as described in Section B-1d. The WSPF and the Characterization Information Summary for the waste stream resulting from

waste characterization activities are transmitted to the Permittees, reviewed for completeness, and screened for acceptance before the CCP proceeds with payload assembly of TRU waste into the TRUPACT-II. Only TRU waste that meets the characterization requirements of the WAP is certified by the CCP. Only waste certified to meet the Treatment, Storage, and Disposal Facility Waste Acceptance Criteria (TSDF-WAC), specified in the WAP, is accepted at the WIPP facility for disposal in the permitted Underground Hazardous Waste Disposal Unit (HWDU).

In the event that the Permittees request detailed information on a waste stream, the CCP provides a Waste Stream Characterization Package, as described in Section B3-12b(2). For each waste stream, this package includes the WSPF, AK summary report, Batch Data Reports (BDRs), and analytical raw data associated with waste container characterization as requested by the CBFO.

B-1 Identification of TRU Waste to be Managed at the WIPP Facility

B-1a Waste Stream Identification

TRU waste destined for disposal at WIPP is characterized on a waste stream basis. The waste streams are delineated using AK. Required AK is specified in Section B4 of this QAPjP. If the AK for retrievably stored waste does not comply with these requirements, (i.e., debris waste in Summary Category Group S5000), the CCP reexamines (and characterizes) the waste in the same manner as newly generated waste.

Not all of the waste containers within a waste stream may be available for sampling and analysis at one time. In these instances, the waste streams are divided into waste stream lots based on staging, transportation, or handling issues. Characterization activities are then undertaken on a waste stream lot basis. Once approved, a WSPF is not submitted for subsequent waste stream lots unless warranted by the characterization information (i.e., there are sufficient changes in the characterization of the waste stream such as different Hazardous Waste Codes).

B-1b Waste Summary Category Groups and Hazardous Waste Accepted at the WIPP Facility

Once a waste stream is delineated, a waste matrix code is assigned to the waste stream based on its physical form. Waste streams are then assigned to one of the Summary Category Groups; S3000-Homogeneous Solids, S4000-Soils/Gravel, and S5000-Debris Wastes. These Summary Category Groups are then used to determine further characterization requirements.

The CCP considers only those TRU waste streams that are assigned U.S. EPA Hazardous Waste Codes listed in the WAP, Attachment O (NMED, 1999). Waste identified by unique state Hazardous Waste Codes are acceptable at WIPP provided that they meet the requirements of Section B-1c. The CCP performs characterization of all waste streams as required by the WAP. If during the characterization process, new Hazardous Waste Codes are identified, those wastes are prohibited for disposal at the WIPP facility until a permit modification has been submitted and approved by NMED.

B-1c Waste Prohibited at the WIPP Facility

The following TRU wastes are prohibited for disposal at the WIPP facility:

- Liquid waste. Waste shall contain as little residual liquid as is reasonably achievable by pouring, pumping, or aspirating, and internal containers shall contain less than 1 in. or 2.5 centimeters (cm) of liquid in the bottom of the container. Total residual liquid in any payload container (e.g., 55-gallon [gal.] drum or standard waste box) shall be less than one percent of the volume of that container
- Non-radionuclide pyrophoric materials, such as elemental potassium
- Hazardous wastes not occurring as co-contaminants with TRU waste (non-mixed hazardous waste)
- Wastes incompatible with backfill, seal and panel closure materials, container and packaging materials, shipping container materials, or other wastes
- Wastes containing explosives or compressed gases
- Wastes with polychlorinated biphenyl (PCB) concentrations equal to or greater than 50 parts per million (ppm)
- Wastes exhibiting the characteristic of ignitability, corrosivity, or reactivity (Hazardous Waste Codes D001, D002, or D003)
- Remote-handled TRU waste (waste with a surface dose rate exceeding 200 millirem per hour)
- Any waste container that does not have VOC concentrations values reported for the headspace
- Waste containers that have not undergone either radiographic or visual examination

- Any waste container from a waste stream that has not been preceded by an approved WSPF, as required in Section B-1d of this QAPjP

Before accepting a container holding TRU waste, the Permittees ensure, through audit and as part of the Permittee level data review that the CCP examined the radiography or VE Batch Data Reports to verify that the container held no unvented compressed gas containers and that residual liquid did not exceed one percent by volume in any payload container. If discrepancies or inconsistencies are detected during VE or radiography data review, CCP reviews the radiography or VE videotape(s) (or equivalent media) to resolve those discrepancies and verifies the observed physical form of the waste is consistent with the waste stream description and ensures that no prohibited items are present in the waste. Personnel who review radiography are trained to the same standard as radiography operators. Section B-4 includes a description of the waste verification process that CCP conducts prior to shipping waste to the WIPP facility.

Containers are vented through filters allowing any gases that are generated by radiolytic and microbial processes within a waste container to escape, thereby preventing over pressurization or development of conditions within the container that would lead to the formation of ignitable, corrosive, reactive, or other characteristic wastes.

To ensure the integrity of the WIPP facility, waste streams identified to contain incompatible materials or materials incompatible with waste containers are not shipped to WIPP unless they are treated to remove the incompatibility. The CCP does not certify waste streams identified to contain incompatible materials or materials incompatible with waste containers or backfill.

The VOC concentrations in the headspace of waste containers are limited to those which, when averaged on a room basis, ensure compliance with the performance standards. These limits are presented in Table B-2 as maximum allowable VOC room-averaged headspace concentration limits. There are no maximum allowable headspace gas concentration limits for individual containers, as some containers can exceed these values as long as container headspace averages in a disposal room do not.

B-1d Control of Waste Acceptance

CCP ensures that every waste stream certified for shipment to WIPP is preceded by a WSPF in accordance with CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*. The WSPF and Characterization Information Summary contains the following:

- Waste stream WIPP identification number
- Designated Summary Category Group

- Listing of acceptable knowledge documentation used to identify the waste stream

- Waste characterization procedures used, including title, revision number and/or date of the procedure

Other elements of the Characterization Information Summary are detailed in Section B3-12b(1). After WSPF submittal, if continued waste characterization activities reveal discrepancies that identify different Hazardous Waste Codes or indicate that the waste belongs to a different waste stream, the waste is redefined to a separate waste stream and a new WSPF is submitted.

The Permittees are responsible for the review of the WSPF and Characterization Information Summaries to verify compliance with the restrictions on TRU wastes for WIPP disposal. Waste characterization data confirms the absence of prohibited items specified in Section B-1c.

The CCP provides a Waste Stream Characterization Package (as described in Section B3-12b(2)) to the Permittees upon request. The option for the Permittees to request additional information ensures that the waste being offered for disposal is adequately characterized and accurately described on the WSPF.

B-1e Waste Generating Processes at the WIPP Facility

Not applicable. This section applies to the Permittee.

B-2 Waste Parameters

The following waste analysis parameters are characterized by the CCP prior to waste certification:

- Confirmation of physical form and exclusion of prohibited items listed in Section B-1c

- Toxicity characteristics contaminants listed in 20.4.1.200 NMAC (incorporating 40 CFR 261.24), Table 1 (excluding pesticides), as specified in the WAP, Attachment O (NMED 1999)

- F-listed solvents and P-listed wastes (F001, F002, F003, F004, F005, F006, F007, F009, P015) found in 20.4.1.200 NMAC (incorporating 40 CFR 261.31), as specified in the WAP

- Hazardous constituents included in 20.4.1.200 NMAC (incorporating 40 CFR 261) Appendix VIII as specified in Tables B-1, B-3, and B-4, as well as any other hazardous constituents identified through AK

Tables B-1, B-3, B-4, and B-5 provide the parameters of interest for the constituent groupings and analytical methodologies.

B-3 Characterization Methods

The characterization techniques used by the CCP include AK, which is confirmed by headspace gas sampling and analysis, homogeneous waste sampling and analysis, VE, and radiography. Confirmation characterization activities are performed in accordance with this QAPjP. Table B-6 provides a summary of the characterization requirements for TRU waste.

TRU waste is characterized in lots or batches. A sampling batch is 20 samples or less collected within 14 days of the first sample in the batch. An analytical batch is 20 samples or less (excluding laboratory QC samples), all of which are received by the laboratory within 14 days of the validated time of receipt of the first sample in the batch. On-line integrated headspace gas samples are collected and analyzed within 12 hours using the same system (see also B1-1b). The analytical requirements are specified by the analytical method being used in the on-line system (e.g., GC/MS).

B-3a Sampling and Analytical Methods

B-3a(1) Headspace Gas Sampling and Analysis

The CCP uses headspace gas samples to determine the types and concentrations of VOCs in the void volume of waste containers. The CCP compares VOC constituents to those assigned by AK, and assigns Hazardous Waste Codes, as warranted. This comparison may include an analysis of radiolytically derived VOCs. The CCP also considers radiolysis when assessing the presence of listed waste, and whether radiolysis generates wastes which exhibit the toxicity characteristic. Refer to Permit Attachment B4 for additional clarification regarding Hazardous Waste Code assignment and headspace gas results.

Every TRU waste container or statistically selected containers from waste streams that meet the conditions for reduced headspace gas sampling listed in this section are sampled and analyzed to determine the concentrations of VOC parameters listed in Table B-3 in headspace gases. If composite samples are used, containers used in the composite sample are from the same waste stream with no more than 20 containers being included in a single composite sample. Sampling protocols, equipment, and QA/QC methods for headspace gas sampling are provided in Section B1 of this QAPjP.

In accordance with EPA convention, identification of hazardous constituents detected by gas chromatography/mass spectrometry (GC/MS) methods that are not on the list of target analytes are reported. These compounds are reported as tentatively identified compounds (TICs) in the on-line batch data report and are added to the target analyte list for that waste stream if they appear in 20.4.1.200 NMAC (incorporating 40 CFR 261) Appendix VIII and are detected in 25 percent of the samples from a given waste stream. CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data* addresses adding TICs to the target analyte list. The headspace gas analysis quality assurance objectives (QAOs) are specified in Table B3-2.

B-3a(1)(i) Reduced Sampling Requirements for Homogeneous Solid or Soil/Gravel Waste Streams with No VOC-Related Hazardous Waste Codes

Headspace gas VOCs that do not exceed the program required quantitation limits (PRQLs) in Table B3-2 are not significant and do not impact the AK confirmation, assignment of additional Hazardous Waste Codes, or worker/public health. Headspace gas samples that do not exceed the program PRQLs are not significant to the activities that use the results of headspace gas sampling defined in the WAP. Therefore, 100 percent headspace gas sampling of homogeneous solid and soil/gravel wastes that have no VOC-related Hazardous Waste Codes assigned is unnecessary and does not provide additional protection of human health and the environment. Such waste streams may qualify for reduced headspace gas sampling if they meet certain criteria.

In order for a waste stream to qualify for reduced headspace gas sampling, the waste stream or waste stream lot must consist of more than 10 containers and the following conditions must be met:

- The waste stream is a homogeneous solid or soil/gravel waste stream that has no VOC-related Hazardous Waste Codes assigned to it
- The results of the solid sampling and analysis confirm that no VOC-related Hazardous Waste Codes should be assigned to the waste stream

If a waste stream meets these conditions for reduced headspace gas sampling, the CCP randomly selects containers for headspace gas sampling and analysis using the statistical approach in Section B2-2b.

B-3a(1)(ii) Reduced Sampling Requirements for Thermally Treated Waste Streams

The potential sources of VOCs in the headspace of TRU waste containers are: the waste matrix, the packaging, and the byproducts of radiolysis. If the waste matrix contains no

significant VOCs due to high-temperature thermal processes, the contribution from each of these potential sources are quantified without the use of 100 percent headspace gas sampling, while maintaining data quality sufficient for the purposes specified in the WAP. If the waste matrix contains no significant VOCs because high-temperature thermal processes were used in generating the waste or the waste was subjected to high-temperature thermal processes, then any significant concentrations of VOCs measured in the headspace gas will likely not have originated from the waste matrix. Consequently, the only remaining sources for VOCs present in the headspace gas are the packaging and the byproducts of radiolysis. Hazardous Waste Codes are not assigned based on headspace gas VOCs that are a result of packaging or radiolysis. It is not necessary to sample 100 percent of the containers for headspace gas VOCs to establish a representative concentration of VOCs present in the headspace gas due to packaging and radiolysis. Such waste streams qualify for reduced headspace gas sampling if they meet certain criteria.

In order for a waste stream to qualify for reduced headspace gas sampling, the waste stream or waste stream lot must consist of more than 10 containers and the following conditions must be met:

- The waste stream must have either been generated using a high-temperature thermal process or been subjected to a high-temperature thermal process after generation that resulted in the reduction of matrix-related VOCs in the headspace to concentrations below the PRQLs in Table B3-2

- The CCP must have documentation demonstrating that high-temperature thermal processes were used

If a waste stream meets these conditions for reduced headspace gas sampling, the CCP may choose to randomly select containers for headspace gas sampling and analysis using the statistical approach in Section B2-2b.

B-3a(2) Homogeneous Waste Sampling and Analysis

The CCP samples homogeneous and soil/gravel wastes to confirm U.S. EPA Hazardous Waste Codes assigned by AK. Sampling is accomplished through core or other EPA approved sampling which is described in Section B1-2. For those waste streams defined as Summary Category Groups S3000 or S4000, debris that may also be present within these wastes need not be sampled. The waste containers for sampling and analysis are selected randomly from the population of containers for the waste stream. The random selection methodology used is described in Section B2.

The CCP uses totals or toxicity characteristic leaching procedures (TCLP) analyses for PCBs, VOCs, SVOCs, and RCRA-regulated metals to determine waste parameters in soils/gravels and solids that are important to the performance within the disposal system (Tables B-4 and B-5). To determine if a waste exhibits a toxicity characteristic for compounds specified in 20.4.1.200 NMAC (incorporating 40 CFR §261, Subpart C), TCLP may be used instead of total analyses. The CCP uses the results from these analyses to determine if a waste exhibits a toxicity characteristic. The mean concentration of toxicity characteristic contaminants is calculated for each waste stream and reported with an upper 90 percent confidence limit (UCL_{90}). The UCL_{90} values for the mean measured contaminant concentrations in a waste stream is compared to the specified regulatory levels in 20.4.1.300 NMAC (incorporating 40 CFR §262), expressed as total/TCLP values, to determine if the waste stream exhibits a toxicity characteristic. A comparison of total analyses and TCLP analyses is presented in Appendix C3 of the WIPP RCRA Part B Permit Application (DOE, 1997), and a discussion of the UCL_{90} is found in Section B2-3a. If toxicity characteristic wastes are identified, they are compared to those determined by AK and toxicity characteristic waste codes are revised, as warranted.

B-3a(3) Laboratory Qualification

Qualified laboratories providing analytical services are qualified through participation in the DOE-CBFO Performance Demonstration Programs. In addition, methods and supporting performance data demonstrating QAO compliance are ensured by the Permittees during the annual certification audit.

Analytical methods used: 1) satisfy the appropriate QAOs; 2) follow EPA method guidance where available; and 3) are implemented through standard operating procedures. These analytical QAOs are discussed in detail in Section B3.

B-3b Acceptable Knowledge

AK is used in TRU waste characterization activities in three ways:

- To delineate TRU waste streams
- To assess whether TRU wastes exhibit a toxicity characteristic (New Mexico Hazardous Waste Management Regulations in 20.4.1.200 NMAC incorporating 40 CFR 261.24)
- To assess whether TRU wastes are listed (20.4.1.200 NMAC, incorporating 40 CFR 261.31)

AK is discussed in detail in Section B4, which outlines the minimum set of requirements met by the CCP in order to use AK.

B-3c Radiography and Visual Examination

Radiography is a nondestructive qualitative and semi-quantitative technique that involves X-ray scanning of waste containers to identify and verify waste container contents. VE constitutes opening a container and physically examining its contents. VE consists of either observing the filling of waste containers or opening full containers and physically examining their contents.

Radiography or VE are used to examine every waste container to verify its physical form. These techniques detect prohibited items such as liquid wastes and containerized gases which are prohibited for WIPP disposal. The prohibition of liquids and containerized gases prevents the shipment of corrosive, ignitable, or reactive wastes. Personnel perform radiography in accordance with CCP-TP-011, *CCP Radiography Inspection Operating Procedure* or CCP-TP-012, *CCP WIT Digital Radiography / Computed Tomography* and VE in accordance with CCP-TP-013, *CCP Waste Visual Examination and Repackaging*. Radiography and VE are performed by trained and qualified personnel. Radiography and VE achieve the following:

- Verification and documentation the physical form of each waste container
- Identification of any prohibited waste in the waste container
- Confirmation that the physical form of the waste matches its waste stream description (i.e., homogeneous solids, soil/gravel, or debris waste [including uncategorized metals])

If the physical form does not match the waste stream description, the waste is designated as another waste stream and assigned the preliminary Hazardous Waste Codes associated with that new waste stream assignment. That is, if radiography or VE indicate that the waste does not match the waste stream description produced by AK characterization, a nonconformance report (NCR) is completed and the inconsistency resolved as specified in Section B4. The proper waste stream assignment is determined (including preparation of a new WSPF), the correct Hazardous Waste Codes are assigned, and the resolution is documented. The AK confirmation process is discussed in Section B4.

Under some conditions, Tthe CCP conducts VE of waste containers in lieu of radiography. If CCP uses VE in lieu of radiography, the detection of any liquid waste in non-transparent inner containers, detected from shaking the container, is handled by assuming that the container is filled with liquid and adding this volume to the total liquid in the payload

container (e.g., 55-gal. drum or standard waste box). The payload container is then repackaged or rejected to exclude the container if it does not meet the requirements of Section B-1c. When radiography is used or VE of transparent inner containers is performed, if any liquid in inner containers is detected, the volume of liquid is added to the total for the payload container. Radiography, or the equivalent, is used on the existing or stored waste containers to verify the physical characteristics of the TRU waste corresponding with its waste stream identification and waste matrix code and to identify prohibited items. The results of radiography are verified through VE of a statistically-selected subpopulation of TRU waste containers in each Summary Category Group as specified in Section B2-1. Radiographic examination protocols and QA/QC methods are provided in Section B1-3.

B-3d Characterization Techniques and Frequency for Newly Generated and Retrievably Stored Waste

Section B4 describes the use of AK to delineate TRU waste streams for the purpose of grouping waste by Summary Category Group for further characterization. Additional analyses required do not differ based on the waste stream, but only on the physical form of the waste (i.e., heterogeneous debris waste cannot be sampled for totals analysis). Both retrievably stored and newly generated waste streams are delineated using AK, as described in Sections B-3b and B4. Every waste stream is assigned Hazardous Waste Codes based on AK, and these Hazardous Waste Codes are confirmed using headspace gas sampling and analysis (all Summary Category Groups) and solid sampling and analysis (Summary Category Groups S3000 and S4000 only).

CCP uses radiography or VE to verify the physical form of retrieveably stored TRU waste. For newly generated waste, physical form and prohibited items are verified during packaging, using the VE technique. Radiography or VE is also used in conjunction with AK to characterize heterogeneous debris wastes. Radiography or VE and the associated information compiled from AK (e.g., age of the waste, generating process) are used to determine the RCRA-regulated constituents present in the waste.

All waste containers or randomly selected containers from waste streams that meet the conditions for reduced headspace gas sampling listed in Section B-3a(1) are sampled and analyzed for headspace gas VOCs. A statistically selected portion of each homogeneous solids and soil/gravel waste stream is sampled and analyzed for RCRA-regulated total VOCs, SVOCs, and metals. Sampling and analysis methods used to characterize waste are summarized in Section B-3a. In the process of performing organic headspace and solid sample analyses, compounds not identified on the current target

analyte list are identified. These compounds are reported as TICs. TICs found in 25 percent of the samples and listed in 20.4.1.200 NMAC Appendix VIII (incorporating 40 CFR 261) are compared with AK data to determine whether the TIC is in a listed waste in the waste stream. TICs identified through headspace gas analysis that meet the Appendix VIII listing and 25 percent criteria for a waste stream are added to the headspace gas target analyte list regardless of the hazardous waste associated with the waste stream.

TICs subject to inclusion on the target analyte list that are toxicity characteristic parameters are added to the target analyte list regardless of origin because the hazardous waste designation for these numbers is not based on source. However, for toxicity characteristic and non-toxic F003 constituents, the CCP takes concentration into account when assessing whether to add a U.S. EPA Hazardous Waste Code. TICs reported from the totals, VOC, or SVOC analyses may be excluded from the target analyte list for a waste stream if the TIC is a constituent in an F-listed waste whose presence is attributable to waste packaging materials or radiolytic degradation described in AK documentation. If the TIC associated with a total VOC or SVOC analysis cannot be identified as a component of waste packaging materials or as a product of radiolysis, the CCP adds these TICs to the list of hazardous constituents for the waste stream (and assigns additional EPA listed Hazardous Waste Codes, if appropriate). A permit modification is submitted to NMED for their approval to add these constituents (and waste codes), if necessary. For toxicity characteristic compounds and non-toxic F003 constituents, the CCP considers the waste concentration when determining whether to change a Hazardous Waste Code. Refer to Section B3-1 for additional information on TIC identification.

Waste characterization solid sampling and analysis activities differ for retrievably stored waste and newly generated waste. Table B-1 provides a summary of hazardous waste characterization requirements for all TRU waste by waste characterization parameter. Table B-6 summarizes the parameters, characterization methods, and rationale for CH-TRU wastes according to their form. The waste characterization data collection design is described in the sections B-2d(1), B-3d(1)a, B-3d(1)b, and B-3d(2).

The CCP disposes of repackaged or treated TRU waste at the WIPP facility. If waste is repackaged, the container undergoes characterization required of newly generated waste. Repackaged waste also undergoes headspace gas analysis after repackaging, as long as the criteria specified in Section B1-1 are met. Treated waste is considered newly generated waste and retains the original waste stream listed Hazardous Waste Code designation.

B-3d(1) Newly Generated Waste

The RCRA-regulated constituents in newly generated wastes are documented and verified at the time of generation based on AK for the waste stream. Newly generated TRU waste characterization begins with verification that processes generating waste have been

operating within established written procedures. Waste containers are delineated into waste streams using AK. Verification that the physical form of the waste (Summary Category Group) corresponds to the physical form of the assigned waste stream is accomplished during packaging (using the VE technique). This process is different than the process described in Section B1-3b(3) and consists of the operator confirming that the waste is assigned to a waste stream that has the correct Summary Category Group for the waste being packaged. If a confirmation cannot be made, corrective actions are taken as specified in Section B3. Instead of using a video/audio tape as required with VE in support of radiography in Section B1-3b(3), the VE technique for newly generated waste (or repackaged retrievably stored waste) uses a second operator, who is equally trained to the requirements stipulated in Section B1-3b(3) to provide additional verification by reviewing the contents of the waste container to ensure accurate reporting. If the second operator cannot provide concurrence, corrective actions are taken as specified in Section B3. The subsequent waste characterization activities depend on the assigned Summary Category Group, since waste within the Homogeneous Solids and Soil/Gravel Summary Category Groups are characterized using different techniques than the waste in the Debris Waste Summary Category Group.

Containers of newly generated waste or newly generated waste containers randomly selected from waste streams that meet the conditions of reduced headspace gas sampling listed in Section B-3a(1)(i) undergo headspace gas analysis for VOC concentrations prior to shipment. Headspace gas data are used to confirm AK waste characterization as specified in Section B4. The headspace gas sampling method is described in Section B1-1.

B-3d(1)(a) Sampling of Newly Generated Homogeneous Solids

The CCP randomly samples newly generated mixed waste streams of homogeneous solids a minimum of once per year for total PCBs, VOCs, SVOCs and metals. An initial ten-sample set is collected to develop a baseline control chart. The CCP samples homogeneous solids once per year only if the process operated within procedurally established bounds without any process changes or fluctuations that resulted in either a new waste stream or the identification of a new hazardous waste constituent in that waste stream. Otherwise, the waste is considered as process batches and each batch undergoes sampling and analysis. Process changes and process fluctuations are determined using statistical process control charting techniques; these techniques use the ten-sample baseline and historical data to determine the limits for indicator species and subsequent periodic sampling to assess process behavior relative to historical limits. If the limits are exceeded, the waste stream is recharacterized according to procedures required for retrievably stored waste (i.e., waste sampling frequency will be increased). Control charting for newly generated homogeneous solids waste is described in Section B2-4.

Also, as another control of waste generated from a particular process, the CCP establishes the bounds for the waste generating process by specific written procedures for that process. Examples of parameter bounds that could affect a waste generated by a process are volumes of input material, change in the input material, and any other changes that would change the output of that process.

The CCP ensures that the procedures for waste generating processes include controls of the waste stream. These procedures consist of sections containing the following information:

- Responsible organizations for implementing the requirements of the procedure
- Material inputs
- Waste streams generated
- Process controls and range of operation (bounds) that affect final hazardous waste determinations
- Rate and quantity of hazardous waste generated
- List of applicable operating procedures relevant to the hazardous waste determination

Events where procedurally established bounds are exceeded or any condition of normal operation is not being met trigger an increased sampling frequency of the waste stream. As long as a process does not change outside of established bounds within a year, the waste generated by that process has the same characteristics, and therefore, a minimum of one sample is collected annually to verify the lack of variability of that waste stream. Compliance with process procedures and the maintenance of the parameters specified by those procedures is verified by the Permittees during the Permittees' Audit and Surveillance Program.

The records generated by the process procedures are examined weekly for indications of process changes or limits being exceeded that change the hazardous constituents identified in the waste stream or that add relevant prohibited materials. If these changes are discovered, the CCP notifies the Permittees. The CCP does not certify the waste until a follow-up sample of process waste is collected and analyzed to ensure that the container contents are within those identified on the WSPF. If the second analysis is not consistent with the WSPF information, all waste containers in question are segregated and a new WSPF and waste generation procedures/bounds are established. Records of that analysis are available for examination by the auditors and are provided to NMED upon request. If records of the analysis are not available, the Permittees will not accept the waste stream at

the WIPP facility. If the CCP changes a process but determines that increased sampling is not required because the change does not affect waste generated by that process, the CCP notifies the Permittees in the form of a memorandum to the DOE-CBFO Waste Characterization Manager. The Permittees must concur with the decision to not increase the sampling frequency before any additional waste from that process is shipped.

The toxicity characteristics of newly generated homogeneous solids and soil/gravel waste streams are determined using total analysis of toxicity characteristic contaminants or TCLP. The CCP uses TCLP instead of total analysis to determine if a waste exhibits a toxicity characteristic for compounds specified in 20.4.1.200 NMAC (incorporating 40 CFR §261, Subpart C). The sampling methods that the CCP uses for homogeneous solids and soil/gravel wastes are described in Section B1-2.

B-3d(1)(b) Sampling of Newly Generated Soils/Gravels

Newly generated soil/gravel wastes are generated primarily by remediation or decontamination and decommissioning (D&D) activities. Process controls for these types of waste cannot readily be defined and, therefore, sampling cannot follow that used for newly generated homogeneous waste. The CCP uses the procedure specified in Section B-3a(2) to statistically select the number of containers of newly generated soil/gravel waste containers to be sampled. The CCP estimates the number of containers to be sampled within the waste stream based on the expected volume of the waste stream and whether standard waste box (SWB) or 55-gallon drum containers are used.

B-3d(2) Retrievably Stored Waste

Retrievably stored waste containers are first delineated into waste streams using AK. These containers are then examined using either radiography or VE to confirm the physical waste form, to verify the absence of prohibited items, and to determine the waste characterization techniques to be used based on the Summary Category Group. Repackaged retrievably stored waste, or any retrievably stored waste with inadequate AK, is characterized using either the retrievably stored or newly generated waste characterization process, whichever results in greater sampling requirements. Radiography or VE results are compared to AK results to ensure correct waste matrix code assignment and identification of prohibited items. If radiography or VE do not confirm the physical waste form determined by AK, the waste is reassigned to a new waste stream, as specified in Section B-3c. CCP may elect to substitute VE for radiography.

To confirm the results of radiography, a statistically selected number of the TRU waste container population are visually examined by opening containers to inspect waste contents to verify radiography results. Section B2 contains the approach used to statistically select the number of drums to be visually examined. For homogeneous waste

and soils/gravels selected for sampling, the containers opened for sampling may be used to help fulfill the VE requirements.

The CCP establishes container safety conditions that are met prior to opening containers for VE as a QC check on radiography. The establishment and use of container safety conditions meet the following criteria:

- Container safety conditions are based on characteristics of the waste and the site-specific operational safety requirements for VE (e.g., VE facility limitations and Hazards Analysis)

- The method for determining the container safety conditions, the analysis performed, and the actual conditions established are part of CCP documentation that is submitted to the DOE-CBFO for approval (e.g., QAPjP, procedures)

- If a randomly selected container does not meet the container safety conditions, another randomly selected container from the same Summary Category Group is visually examined in its place

- Container safety conditions that are established may not reduce the number of containers that are visually examined based on the statistical requirements of Section B2

Retrievably stored containers or retrievably stored containers randomly selected from waste streams that meet the conditions for reduced headspace gas sampling listed in Section B-3a(1) undergo headspace gas analysis for VOC concentrations. The headspace gas sampling method is provided in Section B1-1. Headspace gas data are used to confirm AK waste characterization, as described in Section B4-3d.

As described in Section B2-1, a statistically-selected portion of retrievably stored homogeneous solids and soil/gravel wastes are sampled and analyzed for total VOCs, SVOCs, and metals. The approach used to statistically select drums for homogeneous solids and soil/gravel wastes is different than the method used to select waste containers for VE. The sampling methods for these wastes are provided in Section B1. The approach used to statistically select the number of drums to be visually examined is described in Section B2.

The CCP determines the toxicity characteristic of retrievably stored homogeneous solids and soil/gravel wastes using total analysis of toxicity characteristic parameters or TCLP. To determine if a waste exhibits a toxicity characteristic for compounds specified in 20.4.1.200 NMAC (incorporating 40 CFR §261, Subpart C), the CCP may use TCLP

instead of total analyses. Appendix C3 of the WIPP RCRA Part B Permit Application (DOE, 1997) discusses comparability of totals analytical results to those of the TCLP method.

Representativeness of containers selected for VE and waste subjected to homogeneous solids and soil/gravel sampling and analysis is ensured by the CCP via examination of documentation that shows that true random samples were collected. (Because representativeness is a quality characteristic that expresses the degree to which a sample or group of samples represent the population being studied, the random sampling of waste streams ensures representativeness).

B-4 Data Verification and Quality Assurance

The CCP ensures that its waste characterization meets WAP requirements through data validation, verification, and reporting controls. Verification occurs at 3 levels: 1) the CCP data generation level, 2) the CCP project level, which consists of verification and validation by the CCP to ensure that applicable WAP requirements are met and (3) the Permittee level. The validation process and requirements at levels (1) and (2) are described in Section B3-10.

B-4a Data Generation and Project Level Verification Requirements

B-4a(1) Data Quality Objectives

The waste characterization data obtained through implementation of this QAPjP are used by the Permittees to ensure that the regulatory requirements of the WAP are met with regard to compliance and to ensure that TRU wastes are properly managed during the disposal phase.

To satisfy the RCRA regulatory compliance requirements, the following are DQOs established by the WAP and flowed down to this QAPjP:

Headspace Gas Sampling and Analysis

- To identify VOCs and quantify the concentrations of VOC constituents in the total waste inventory to ensure compliance with the environmental performance standards of 20 4.1.500 NMAC (incorporating 40 CFR 264.601[c])

- To confirm hazardous waste identification by AK

Homogeneous Waste Sampling and Analysis

- To compare UCL_{90} values for the mean measured contaminant concentrations in a waste stream with specified toxicity characteristic levels in 20 4.1.200 NMAC (incorporating 40 CFR §261), to determine if the waste is hazardous, and to confirm hazardous waste identification by AK

- To report the average concentration of hazardous constituents in a waste stream, as specified in 20.2.1.200 NMAC (incorporating 40 CFR §261) Appendix VIII, with a 90 percent confidence interval, with all averages greater than PRQL considered a detection and subsequent assignment of the waste (if an adequate explanation for the constituent cannot be determined) as a hazardous waste, and to confirm hazardous waste identification by AK.

Radiography

- To verify the TRU waste streams by waste matrix code for purposes of physical waste form identification and determination of sampling and analytical requirements, and to identify prohibited items

- To confirm the waste stream delineation by AK

Visual Examination

- To verify TRU waste streams by waste matrix code for purposes of physical waste form identification, determination of sampling and analytical requirements, and to identify prohibited items

- To provide a process check on a sample basis by verifying the information determined by radiography

- To confirm the waste stream delineation by AK

Reconciliation of these DQOs by the SPM is addressed in Section B3-11. Reconciliation requires determining whether sufficient types, quality, and quantity of data have been collected to ensure that the DQOs cited above can be achieved.

B-4a(2) Quality Assurance Objectives

The CCP demonstrates compliance with each QAO associated with the various characterization methods presented in Sections B3-2 through B3-9. The CCP SPM performs reconciliation, at the project level, of the data sets with the DQOs established in this QAPjP. The CCP SPM concludes that all of the DQOs have been met for the

characterization of the waste stream prior to submitting a WSPF to the Permittees for approval in accordance with CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*.

The following QAO elements are considered for each technique, as a minimum:

- Precision - a measure of the mutual agreement among multiple measurements
- Accuracy - the degree of agreement between a measurement result and the true or known value
- Completeness - a measure of the amount of valid data obtained from a method compared to the total amount of data obtained (expressed as a percentage)
- Comparability - the degree to which one data set can be compared to another
- Representativeness - the degree to which sample data accurately and precisely represent characteristics of a population

A more detailed discussion of the QAOs including a mathematical representation can be found in Section B3, which describes the QAOs associated with each sampling and analysis method.

B-4a(3) Sample Control

The CCP implements a sample handling and control program that includes the maintenance of field documentation records, proper labeling and a chain of custody (COC) record. The procedures referenced in the QAPjP document the sample control program and include COC forms to control the sample from the point of origin to the final analysis result reporting. The Permittees review and approve the QAPjP, including the determination that the sample control program is adequate. The approved QAPjP is provided to the NMED by the Permittees prior to waste shipment and before the CCP audit. Details of the sample control program are provided in Section B1 and are summarized to include:

- Field documentation of samples including point of origin, date of sample, container identification, sample type, analysis requested, and COC number
- Labeling and/or tagging including sample number, sample ID, sample date, sampling conditions, and analysis requested

- COC control including name of sample relinquisher, sample receiver, and date and time of sample transfer

- Proper sample handling and preservation

B-4a(4) Data Generation

The CCP formats for reporting waste characterization data in batch data reports are specified in several procedures. These procedures comply with the waste characterization data reporting requirements described in Section B3-10a.

As described in Section B-3a(3), analytical laboratories used by the CCP to analyze WIPP waste characterization samples have established, and documented QA/QC programs.

The CCP analytical QA/QC program includes the following:

- Facility organization
- List of equipment/instrumentation
- Operating procedures
- Laboratory QA/QC procedures
- Quality assurance review
- Laboratory records management

B-4a(5) Data Verification

Batch Data Reports document the testing, sampling, analytical, and on-line results from required characterization activities, and required QA/QC activities. Data validation, review, and verification are performed at the data generation level and the CCP project level before the required data are transmitted to the Permittees. Section B3-10 discusses the data validation process in greater detail. NMED may request, through the Permittees, copies of any Batch Data Report or the raw data validated by the CCP to check the Permittees' audit of the validation and verification process.

B-4a(6) Data Transmittal

Batch Data Reports include the information required by Section B3-10 and are transmitted by hard copy or electronically (provided a hard copy is available on demand) from the data generation level to the CCP project level.

Once a waste stream is fully characterized the SPM submits a WSPF, and a Characterization Information Summary to the Permittees, which includes a record of reconciliation with DQOs as described in Section B3-12b(1). As part of the waste characterization data submittal, the CCP transmits the data electronically to the Permittees

via the WIPP Waste Information System (WWIS) using the appropriate modules as described in the "WIPP Waste Information System User's Manual for Use by Shippers/Generators" (DOE 2001). The information on the WSPF is used as the basis for acceptance of waste characterization information on TRU wastes to be disposed of at WIPP.

B-4a(7) Records Management

The QA Records Program for the CCP is described in CCP-QP-008, *CCP Records Management*. Records generated by the CCP related to waste characterization activities are maintained in the CCP files and/or the site records system.

Testing, on-line sampling, and analytical records, along with Batch Data Reports are forwarded to the CCP Records Custodian for inclusion in the CCP files and for appropriate processing. Raw data obtained by testing, sampling, and analyzing TRU waste in support of this QAPjP are identifiable, legible, and provide documentary evidence of quality. A detailed description of CCP-specific records management activities is provided in Section B5-2.

The records inventory and disposition schedule (RIDS) is defined in CCP-QP-028, *CCP Records Filing, Inventorying, Scheduling, and Dispositioning*. All records relevant to an enforcement action under the WAP, regardless of disposition, are maintained in the CCP files and/or the site records system until NMED determines that the records are no longer needed for enforcement action. The records will then be dispositioned as specified in the approved RIDS. Waste characterization data and QA/QC records related to TRU waste to be shipped to WIPP are designated as either Lifetime Records or Non-Permanent Records. Records that are designated as Lifetime Records are maintained by the CCP and/or the site records system for the life of the waste characterization program plus six years, then offered to WIPP for permanent archival of information of these records in the appropriate form, or transferred to the appropriate Federal Records Center (FRC). Waste characterization records designated as Non-Permanent Records are maintained for ten years from the date of (record) generation and then dispositioned according to their approved RIDS. At a minimum, the records shown in Table B-7 are maintained by CCP and/or the site records system as Lifetime or Non-Permanent Records as indicated. All applicable records are dispositioned before the CCP ceases to operate.

B-4b Permittee Level: Waste Screening and Verification of TRU Waste

This section is not applicable to CCP. This section applies to the Permittees.

B-4b(1) Phase I Waste Stream Screening and Verification

The first phase of the waste screening and verification process occurs before TRU waste is shipped to the WIPP facility. Before the Permittees begin the process of accepting TRU waste from the CCP, an initial audit is conducted as part of the Permittees' Audit and Surveillance Program. The audit of CCP provides verification of characterization procedures; Batch Data Report preparation; and recordkeeping that ensures that all applicable provisions of the WAP requirements are met. Another portion of the Phase I verification is the WSPF approval process. At the WIPP facility, this process includes verification that all of the required elements of a WSPF are present and that the summarized waste characterization information meets acceptance criteria required for compliance with the WAP (Section B3-12b(1)).

Once the CCP has prepared this QAPjP, which includes applicable WAP requirements, it is submitted to the Permittees for review and approval. The CCP implements the specific parameters of this QAPjP after Permittee approval. The initial CCP RCRA audit is performed at some point after this implementation has taken place, but prior to shipment of TRU waste from the CCP to WIPP. Additional audits, focusing on the results of waste characterization, are performed at least annually. The Permittees have the right to conduct unannounced audits and to examine any records that are related to the scope of the audit.

When the required waste stream characterization data have been collected by the CCP and the initial audit is successfully completed, the CCP SPM completes the WSPF and submits it to the Permittees, along with the accompanying Characterization Information Summary for that waste stream. All data necessary to check the accuracy of the WSPF is transmitted to the Permittees. This provides notification that the CCP considers that the waste stream (identified by the waste stream identification number) has been adequately characterized for disposal prior to shipment to WIPP. The Permittees then compare headspace gas, radiography, visual examination and solid sampling and analysis data obtained subsequent to submittal and approval of the WSPF (and prior to waste shipment) with characterization information presented on this form. If the Permittees determine (through the data comparison) that the characterization information is adequate, the WSPF is approved. Prior to the first shipment of containers from the approved waste stream, the approved WSPF and accompanying Characterization Information Summary is provided to NMED. If the data comparison indicates that analyzed containers have hazardous wastes not present on the WSPF, or a different waste matrix code applies, the WSPF is in error and is resubmitted. Ongoing WSPF examination is discussed in detail in Section B-4b(1)(ii).

For subsequent shipments, the CCP also transmits the data on a container basis via the WWIS prior to shipment of that container. This data submittal occurs at any time as the data are being collected, but is complete for each container prior to shipment of that container. The WWIS conducts internal edit/limit checks based on the approved WSPF. The Permittees compare ongoing sampling and analysis characterization data obtained and submitted via the WWIS to the approved WSPF. If this comparison shows that containers have hazardous wastes not reported on the WSPF, or a different waste matrix code applies, the data are rejected and the waste containers are not accepted for shipment.

If discrepancies arise as a result of the Phase I review, the CCP is contacted by the Permittees and provides the necessary additional information to resolve the discrepancy before that waste stream is approved for disposal at the WIPP facility. If the discrepancy is not resolved, the waste stream is not approved for shipment.

B-4b(1)(i) WWIS Description

The CCP supplies the required data to the Permittees via the WWIS. The Permittees will use the WWIS to verify that all of the supplied data meet the applicable edit and limit checks prior to the shipment of any TRU waste to WIPP. The WWIS automatically notifies the CCP if any of the supplied data fails to meet the requirements of the edit and limit checks via an appropriate error message. The CCP corrects the discrepancy with the waste or the waste data and re-transmits the corrected data prior to acceptance of the data by the WWIS. The Permittees review data reported for each container of each shipment prior to providing notification to the CCP that the shipment is acceptable.

Access to the WWIS is controlled by the Permittees' Data Administrator (DA) who controls the WWIS users based on approval from management personnel.

The CCP only has access to CCP data supplied to WWIS, and only until the data have been formally accepted by the Permittees. After the data have been accepted, the data protected from indiscriminate change and only changed by an authorized DA.

B-4b(1)(ii) Examination of the Waste Stream Profile Form and Container Data Checks

The Permittees are responsible for the verification of completeness and accuracy of the WSPF (Section B3-12b(1)). The assignment of the waste stream description, waste matrix code group, and Summary Category Groups; the results of waste analyses; the AK summary documentation; the methods used for characterization; the DOE-CBFO certification, and appropriate designation of Hazardous Waste Code(s) are examined. If the WSPF is inaccurate, efforts are made to resolve discrepancies by contacting the CCP.

If discrepancies in the waste stream are detected, the CCP implements a non-conformance action to identify, document, and report discrepancies.

Waste data transferred via the WWIS after WSPF approval is compared with the approved WSPF. Any container with a hazardous waste stream description different from its WSPF is not shipped to the WIPP for disposal.

The following three verifications are performed on data from the following determinations: 1) an assignment of the waste stream's waste description (by waste matrix codes) and waste matrix code group; 2) a determination of ignitability, reactivity, and corrosivity; and 3) a determination of compatibility. The Characterization Information Summary indicates if the waste was checked for the characteristics of ignitability, corrosivity, and reactivity.

B-4b(1)(iii) WIPP Audit and Surveillance Program

This section is not applicable to the CCP. It applies to the Permittees.

B-4b(2) Phase II Waste Shipment Screening and Verification

Phase II of the waste shipment screening and verification process includes examination of a waste shipment after the waste shipment has arrived at the WIPP. The Phase-II determinations are: 1) a determination of the completeness and accuracy of the Hazardous Waste Manifest; 2) a determination of waste shipment completeness; 3) a determination of land disposal restriction notice completeness; and 4) an identification and resolution of waste shipment irregularities. Only those waste containers that pass all Phase II waste screening determinations are emplaced at WIPP. For each container shipped, the CCP provides the following information:

Hazardous Waste Manifest Information:

- Generator/storage site name and EPA ID
- CCP contact name and phone number
- Quantity of waste
- List of the Hazardous Waste Codes in the shipment
- Listing of all shipping container IDs (TRUPACT-II serial number)
- Signature of authorized generator representative

Specific Waste Container information:

- Waste Stream Identification Number
- List of Hazardous Codes per Container
- Certification Data
- Shipping Data (Assembly numbers, ship date, shipping category, etc.)

This information is also supplied electronically to the WWIS. The container-specific information will be supplied electronically as part of the Permittee Level Phase I Screening, and is supplied prior to shipment.

B-4b(2)(i) Examination of the EPA Uniform Hazardous Waste Manifest and Associated Waste Tracking Information

Discrepancies are identified during manifest examination and container bar-code WWIS data comparison. A manifest discrepancy is a difference between the quantity or type of hazardous waste designated on the manifest and the quantity or type of hazardous waste the WIPP facility actually receives. The CCP technical contact (as listed on the manifest) is contacted to resolve the discrepancy. Errors on the manifest are corrected by the WIPP facility with a verbal (followed by a mandatory written) concurrence by the CCP technical contact. If the manifest discrepancies are not resolved in thirty (30) days of waste receipt, the shipment is returned to the facility where the CCP performed the characterization.

B-4b(2)(ii) Examination of the Land Disposal Restriction Notice

TRU waste is exempt from the Land Disposal Restrictions (LDRs) by the Land Withdrawal Act Amendment (Public Law 104-201). This amendment states that WIPP “Waste is exempted from treatment standards promulgated pursuant to section 3004(m) of the Solid Waste Disposal Act (42 U.S. C. 6924(m)) and shall not be subjected to the Land Disposal prohibitions in section 3004(d), (e), (f), and (g) of the Solid Waste Disposal Act.” Therefore, with the initial shipment of a TRU waste stream, the CCP provides the Permittees with a one time written notice. The notice includes the information listed below:

Land Disposal Restriction Notice Information:

- EPA Hazardous Waste Codes (s) and Manifest Numbers of first shipment of a mixed waste stream
- Statement: this waste is not prohibited from land disposal
- Date the waste is subject to prohibition

This information is the applicable information taken from column “268.7(a)(4)” of the “Generator Paperwork Requirements Table” in 20.4.1.800 NMAC (incorporating 40 CFR 268.7(a)(4)). Note that item “5" from the “Generator Paperwork Requirements Table” is not applicable since waste analysis data are provided electronically via the WWIS and item “7" is not applicable since WIPP is exempted from the treatment standards.

The Permittees review the LDR notice for accuracy and completeness. The CCP prepares this notice in accordance with the applicable requirements of 20.4.1.800 NMAC (incorporating 40 CFR §268.7(a)(4)).

B-4b(2)(iii) Verification

This section is not applicable to CCP. This section applies to the Permittees.

B-4b(2)(iv) Waste Shipment Screening QA/QC

This section is not applicable to CCP. This section applies to the Permittees.

B-4b(2)(v) Records Management and Reporting

Records and documents associated with waste characterization data are managed in accordance with CCP-QP-008, *CCP Records Management* and site-specific requirements.

Waste characterization data and documents related to waste characterization that are part of the WIPP facility operating record are managed in accordance with the QAPD and the following guidelines:

B-4b(2)(vi) General Requirements

- Records are legible
- Corrections are made with a single line through the incorrect information, and the date and initial of the person making the correction are added

- Black ink is accepted, unless a copy test has been conducted to ensure the other color ink will copy
- Use of highlighters on records is discouraged
- Records are reviewed for completeness
- Records are validated by the cognizant manager or designee

B-4b(2)(vii) Records Storage

- Active records are stored when not in use
- Quality records are kept in a one-hour (certified) fire-rated container or a copy of a record is stored separately (sufficiently remote from the original) in order to prevent destruction of both copies as a result of a single event such as fire or natural disaster
- Unauthorized access to the records is controlled by locking the storage container or controlling personnel access to the storage area

B-4b(2)(viii) Reporting

This section is not applicable to CCP. This section applies to the Permittees.

Table B-1 Summary of Hazardous Waste Characterization Requirements for Transuranic Waste[a]

Parameter	Techniques and Procedure[f]
Physical Waste Form Summary Category Names S3000 Homogeneous Solids S4000 Soil/Gravel S5000 Debris Wastes	Waste Inspection Procedures Radiography VE (Section B1-3)
Headspace Gases Volatile Organic Compounds (VOCs) Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene cis-1,2-Dichloroethylene Ethyl benzene Ethyl ether Formaldehyde[b] Hydrazine[c] Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane Xylenes Alcohols and Ketones Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	Gas Analysis Gas Chromatography/Mass Spectroscopy (GC/MS), EPA TO-14 or modified SW-846 Method 8240/8260 GC/Flame Ionization Detector (FID), for alcohols and ketones, SW-846 Method 8015
Total Volatile Organic Compounds Acetone Benzene Bromoform Butanol Carbon disulfide Carbon tetrachloride Chlorobenzene Chloroform 1,4-Dichlorobenzene[d] 1,2-Dichlorobenzene[d] Isobutanol Methanol Methyl ethyl ketone Methylene chloride Pyridine[d] 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,2-Trichloro-1,2,2-trifluoroethane	**Total Volatile Organic Compound Analysis** TCLP, SW-846 1311 GC/MS, SW-846 8260 or 8240 GC/FID, SW-846 8015 (Section B3) Acceptable Knowledge for Summary Category S5000 (Debris Wastes)

Table B-1 Summary of Hazardous Waste Characterization Requirements for Transuranic Waste[a] (continued)

Parameter		Techniques and Procedure[f]
1,2-Dichloroethane 1,1-Dichloroethylene Ethyl benzene Ethyl ether Formaldehyde[b] Hydrazine[c]	Trichlorofluoromethane 1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichloroethylene Vinyl chloride Xylenes	
Total Semivolatile Organic Compounds Cresols 1,4-Dichlorobenzene[e] 1,2-Dichlorobenzene[e] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Polychlorinated biphenyls Pentachlorophenol Pyridine[e]		**Total Semivolatile Organic Compound Analysis** TCLP, SW-846 1311 GC/MS, SW-846 8250 or 8270 GC/ECD for PCBs , SW-846 8082[f] (Permit Attachment B3) Acceptable Knowledge for Summary Category S5000 (Debris Wastes)
Total Metals Antimony Arsenic Barium Beryllium Cadmium Chromium Lead	Mercury Nickel Selenium Silver Thallium Vanadium Zinc	**Total Metals Analysis** TCLP, SW-846 1311 ICP- MS, SW-846 6020[f] ICP Emission Spectroscopy, SW-846 6010 Atomic Absorption Spectroscopy , SW-846 7000 (Permit Attachment B3) Acceptable Knowledge for Summary Category S5000 (Debris Wastes)

[a] WAP, HWFP (NMED, 1999).
[b] Required only for homogeneous solids and soil/gravel from Los Alamos National Laboratory.
[c] Required only for homogeneous solids and soil/gravel from Oak Ridge National Laboratory and Savannah River Site.
[d] Can also be analyzed as a semi-volatile organic compound.
[e] Can also be analyzed as a volatile organic compound.
[f] The CCP has the option to incorporate changes resulting from SW-846 updates providing procedures remain compliant with this QAPjP.

Table B-2 Maximum Allowable VOC Room-Averaged Headspace Concentration Limits

COMPOUND	VOC HEADSPACE CONCENTRATION LIMITS[a] (PPMV)
Carbon Tetrachloride	9625
Chlorobenzene	13000
Chloroform	9930
1,1-Dichloroethene	5490
1,2-Dichloroethane	2400
Methylene Chloride	100000
1,1,2,2-Tetrachloroethane	2960
Toluene	11000
1,1,1-Trichloroethane	33700

[a] There are no headspace limits for other VOCs.

Table B-3 Headspace Gas Target Analyte List and Methods

Parameter	Environmental Protection Agency (EPA) Specified Analytical Method
Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene cis-1,2-Dichloroethylene Ethyl benzene Ethyl ether Formaldehyde[b] Hydrazine[c] Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane Xylenes	EPA: Modified TO-14[a] Modified SW-846 8240/8260
Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	EPA: Modified TO-14[a] Modified SW-846 Method 8240/8260 SW-846 Method 8015

[a] U.S. Environmental Protection Agency (EPA), 1988 “Compendium Method TO-14, the Determination of Volatile Organic Compounds (VOC) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatographic Analysis,” in *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*. Research Triangle Park, North Carolina, Quality Assurance Division, Monitoring System Laboratory, U.S. EPA. The most current revision of the specified methods may be used.

[b] Required only for containers of homogeneous solids and soil/gravel waste from Los Alamos National Laboratory.

[c] Required only for containers of homogeneous solids and soil/gravel waste from Oak Ridge National Laboratory and the Savannah River Site.

Table B-4 Required Organic Analyses and Test Methods Organized by Organic Analytical Groups

Organic Analytical Group	Required Organic Analyses	Environmental Protection Agency (EPA) Analytical Method[a,e]
Nonhalogenated Volatile Organic Compounds (VOCs)	Acetone Benzene n-Butanol Carbon disulfide Ethyl benzene Ethyl ether Formaldehyde Hydrazine[b] Isobutanol Methanol Methyl ethyl ketone Toluene Xylenes	8015 8240 8260
Halogenated VOCs	Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,2-Dichloroethane 1,1-Dichloroethylene Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene 1,1,2-Trichloroethane 1,1,1-Trichloroethane Trichloroethylene Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Vinyl Chloride	8015 8240 8260
Semivolatile Organic Compounds (SVOCs)	Cresols (o, m, p) 1,2-Dichlorobenzene[c] 1,4-Dichlorobenzene[c] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Pentachlorophenol Polychlorinated biphenyls (PCB)[d] Pyridine[c]	8250 8270 8082 (for PCBs only)

[a] U.S. Environmental Protection Agency (EPA), 1996, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Third Edition.

[b] Generator/storage sites will have to develop an analytical method for hydrazine. This method will be submitted to the Permittees for approval.

[c] These compounds may also be analyzed as VOCs by SW-846 Methods 8240 and 8260.

[d] Transformer oils containing PCBs have been identified in a limited number of waste streams included in the organic sludges waste matrix code. Therefore, only waste streams included in the solidified organics final waste form shall be analyzed for PCBs.

[e] TCLP (SW-846 1311) may be used to determine if compounds in 20.4.1.200 NMAC (incorporating 40 CFR 261, Subpart C) exhibit a toxicity characteristic.

Table B-5 Summary of Sample Preparation and Analytical Methods for Metals

Parameters	EPA-Specified Analytical Methods[a,b]
Sample Preparation	3051, or equivalent, as appropriate for analytical method
Total Antimony	6010, 6020, 7040, 7041, 7062
Total Arsenic	6010, 6020, 7060, 7061, 7062
Total Barium	6010, 6020, 7080, 7081
Total Beryllium	6010, 6020, 7090, 7091
Total Cadmium	6010, 6020, 7130, 7131
Total Chromium	6010, 6020, 7190, 7191
Total Lead	6010, 6020, 7420, 7421
Total Mercury	7471
Total Nickel	6010, 6020, 7520, 7521
Total Selenium	6010, 7740, 7741, 7742
Total Silver	6010, 6020, 7760, 7761
Total Thallium	6010, 6020, 7840, 7841
Total Vanadium	6010, 7910, 7911
Total Zinc	6010, 6020, 7950, 7951

[a] U.S. Environmental Protection Agency (EPA), 1996. "Test Methods for Evaluating Solid Waste," Laboratory Manual Physical/Chemical Methods, SW-846, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

[b] TCLP (SW-846 1311) may be used to determine if compounds in 20.4.1.200 NMAC (incorporating 40 CFR 261, Subpart C) exhibit a toxicity characteristic.

Table B-6 Summary of Parameters, Characterization Methods, and Rationale for CH TRU Waste (Stored/Newly Generated Waste)

Waste Matrix Code Summary Categories	Waste Matrix Code Groups	Characterization Parameter	Method	Rationale
(Stored Waste)				
S3000-Homogeneous Solids S4000-Soil/Gravel	• Solidified inorganics • Salt waste • Solidified organics • Contaminated soil/debris	Physical waste form	100% Radiography or VE	• Verify waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no free liquids, no incompatible wastes, no compressed gases)
		Headspace gases • Gas volatile organic compounds (VOCs)	100% gas sampling and analysis or statistical sampling[a,b] (see Table B-3)	• Quantify concentration of flammable VOCs • Determine potential flammability of transuranic (TRU) waste headspace gases • Quantify concentrations of VOC constituents in headspace of containers • Ensure that environmental performance standards are not exceeded
		Hazardous constituents • TCLP/total metals • TCLP/total VOCs • TCLP/total semi-VOCs	Statistical sampling[b] (see Tables B-4 and B-5)	• Determine characteristic metals and organics • Determine total quantity of metals, VOCs, and Semi-VOCs

Table B-6 Summary of Parameters, Characterization Methods, and Rationale for CH TRU Waste (Stored/Newly Generated Waste) (continued)

Waste Matrix Code Summary Categories	Waste Matrix Code Groups	Characterization Parameter	Method	Rationale
(Stored Waste)				
S5000-Debris Waste	• Uncategorized metal (metal waste other than lead/cadmium) • Lead/cadmium waste • Inorganic nonmetal waste • Combustible waste • Graphite waste • Heterogeneous waste • Composite filter waste	Physical waste form	100% Radiography VE (statistical sample)[a,b] or visual examination	• Verify waste matrix • Demonstrate compliance with waste acceptance (e.g., no free liquids, no incompatible wastes, no compressed gases)
		Headspace gases • Gas VOCs	100% gas sampling and analysis or statistical sampling[a,b] (see Table B-3)	• Quantify concentration of flammable VOCs • Determine potential flammability of TRU waste headspace gases • Quantify concentrations of VOC constituents in headspace of containers • Ensure that environmental performance standards are not exceeded • Verify AK
		Hazardous constituents • TCLP/total metals • TCLP/total VOCs • TCLP/total semi-VOCs	Acceptable knowledge	• Determine characteristic metals and organics • Determine total quantity of metals, VOCs, and semi-VOCs

Table B-6 Summary of Parameters, Characterization Methods, and Rationale for CH TRU Waste (Stored/Newly Generated Waste) (continued)

Waste Matrix Code Summary Categories	Waste Matrix Code Groups	Characterization Parameter	Method	Rationale
(Newly Generated Waste)				
S3000-Homogeneous Solids S4000-Soil/Gravel	• Solidified inorganic • Salt waste • Solidified organics • Contaminated soil/debris	Physical waste form	Documentation[c] and verification	• Verify waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no free liquids, no incompatible wastes, no compressed gases)
		Headspace gases • Gas VOCs	100% gas sampling and analysis or statistical sampling[a,b] (see Table B-3)	• Quantify concentration of flammable VOCs • Determine potential flammability of TRU waste headspace gases • Quantify concentrations of VOC constituents in headspace of containers • Ensure that environmental performance standards are not exceeded
		Hazardous constituents • TCLP/total metals • TCLP/total VOCs • TCLP/total semi-VOCs	Statistical sampling[b] (see Tables B-4 and B-5)	• Determine characteristic metals and organics • Determine total quantity of metals, VOCs, and semi-VOCs

Table B-6 Summary of Parameters, Characterization Methods, and Rationale for CH TRU Waste (Stored/Newly Generated Waste) (continued)

Waste Matrix Code Summary Categories	Waste Matrix Code Groups	Characterization Parameter	Method	Rationale
(Newly Generated Waste)				
S5000-Debris Waste	• Uncategorized metal (metal waste other than lead/cadmium) • Lead/cadmium waste • Inorganic nonmetal waste • Combustible waste • Graphite waste • Heterogeneous waste • Composite filter waste	Physical waste form	Documentation	• Verify waste matrix • Demonstrate compliance with waste acceptance (e.g., no free liquids, no incompatible wastes, no compressed gases)
		Headspace gases • Gas VOCs	100% gas sampling and analysis or statistical sampling[a,b] (see Table B-3)	• Quantify concentration of flammable VOCs • Determine potential flammability of TRU waste headspace gases • Quantify concentrations of VOC constituents in headspace of containers • Ensure that environmental performance standards are not exceeded • Verify AK
		Hazardous constituents • TCLP/total metals • TCLP/total VOCs • TCLP/total semi-VOCs	Acceptable knowledge	• Determine characteristic metals and organics • Determine total quantity of metals, VOCs, and semi-VOCs

[a] Applies to certain waste streams that meet the conditions in Section B-3a(1).
[b] Number determined as specified in Permit Attachment B2.
[c] See discussion in Permit Attachment B4.

Table B-7 Required Program Records

Lifetime Records
• Field sampling data forms • Field and laboratory chain-of-custody forms • Test facility and laboratory batch data reports • Waste Stream Characterization Packages • Sampling plans • Data reduction, validation, and reporting documentation • AK documentation • Data Reconciliation reports • Waste Stream Profile Forms and Characterization Information Summaries
Non-Permanent Records
• Nonconformance documentation • Variance documentation • Assessment documentation • Gas canister tags • Methods performance documentation • Performance Demonstration Program documentation • Sampling equipment certifications • Calculations and related software documentation • Training/qualification records • QAPjPs documentation (all revisions) • Calibration documentation • Analytical raw data • Procurement records • QA and technical procedures (all revisions) • Audio/video recordings (radiography, VE)

Table B-8 WIPP Waste Information System Data Fields[a]

Characterization Module Data Fields [b]	
Container ID [c] Generator EPA ID Generator Address Generator Name Generator Contact Hazardous Code Headspace Gas Sample Date Headspace Gas Analysis Date Headspace Gas Analyte [d] Headspace Gas Concentration [d] Headspace Gas Char. Method [d] Total VOC Char. Method [d] Total Metals Char. Method [d] Total Semi-VOC Char. Method [d] Item Description Code Haz. Manifest Number NDE Complete [e] PCB Concentration	Total VOC Sample Date Total VOC Analysis Date Total VOC Analyte Name [d] Total VOC Analyte Concentration [d] Total Metal Sample Date Total Metal Analysis Date Total Metal Analyte Name [d] Total Metal Analyte Concentration [d] Semi-VOC Sample Date Semi-VOC Analysis Date Semi-VOC Analyte Name [d] Semi-VOC Concentration [d] Transporter EPA ID Transporter Name Visual Exam Container [e] Waste Material Parameter [d] Waste Material Weight [d] Waste Matrix Code Waste Matrix Code Group Waste Stream Profile Number
Certification Module Data Fields	
Container ID [c] Container type Container Weight Contact Dose Rate Container Certification date Container Closure Date Handling Code	
Transportation Data Module	
TRUPACT Number Assembly Number[f] Container IDs [c,d] ICV Closure Date Ship Date Receive Date	
Disposal Module Data	
Container ID [c] Disposal Date Disposal Location	

[a] This is not a complete list of the WWIS data fields.

[b] Some of the fields required for characterization are also required for certification and/or transportation.

[c] Container ID is the main relational field in the WWIS Database.

[d] This is a multiple occurring field for each analyte, nuclide, etc.

[e] These are logical fields requiring only a yes/no.

[f] Required for 7-Packs of 55 gal drums to tie all of the drums in that assembly together. This facilitates the identification of waste containers in a shipment without need to breakup the assembly.

Figure B-1 Waste Stream Profile Form (Example Only)

Waste Stream Profile Number:_____(1)____
Generator Site Name:_____(2)_____ Technical Contact:_____(3)____
Generator Site EPA ID:_____(2)_____ Technical Contact phone number:_____(3)____
Date of audit report approval by State of New Mexico Environment Department (NMED): _____(4)____
Title, version number, and date of documents used for WAP certification:_____(4)____
_____
Did your facility generate this waste? **9** Yes **9** No If no, provide the name and EPA ID of the original generator:_____(5)____

Waste Stream Information (1)
WIPP ID: _____(6)_____ Summary Category Group:_____(7)____
Waste Matrix Code:_____(8)_____ Waste Stream Name:_____(9)____
Description from the WTWBIR:_____(10)____
_____
Defense Waste: **9** Yes **9** No Check one: **9** CH **9** RH
Number of SWBs_____(11)____
Number of Drums_____(11)_____ Number of Canisters_____(11)____
Batch data reports numbers supporting this waste stream characterization:_____(12)____
List applicable EPA Hazardous Waste Numbers(2) _____(13)____
Applicable TRUCON Content Codes:_____(14)____
Acceptable Knowledge Information (1)
[For the following, enter the supporting documentation used (i.e., references and dates)]
Required Program Information:
Map of site:_____(15)_____
Facility mission description:_____(15)_____
Description of operations that generate waste:_____(15)_____
_____
Waste identification/categorization schemes:_____(15)_____
Types and quantities of waste generated_____(15)_____
Correlation of waste streams generated from the same building and process, as appropriate:
_____(15)_____
Waste certification procedures:_____(15)_____
Required Waste Stream Information:
Area(s) and building(s) from which the waste stream was generated:_____(16)_____
Waste stream volume and time period of generation:_____(16)_____
Waste generating process description for each building:_____(16)_____
Process flow diagrams: _____(16)_____
Material inputs or other information identifying chemical/radionuclide content and physical waste form:
_____(16)_____
Which Defense Activity generated the waste: (check one)_____(16)_____

- Weapons activities including defense inertial confinement fusion
- Naval Reactors development
- Verification and control technology
- Defense Research and development
- Defense nuclear waste and material by products management
- Defense nuclear materials production
- Defense nuclear waste and materials security and safeguards and security investigations

Figure B-1 Waste Stream Profile Form (continued)

Supplemental Documentation:

Process design documents: _____ (17) _____
Standard operating procedures: _____ (17) _____
Safety analysis reports: _____ (17) _____
Waste packaging logs: _____ (17) _____
Test plans/research project reports: _____ (17) _____
Site data bases: _____ (17) _____
Information from site personnel: _____ (17) _____
Standard industry documents: _____ (17) _____
Previous analytical data: _____ (17) _____
Material safety data sheets: _____ (17) _____
Sampling and analysis data from comparable/surrogate waste: _____ (17) _____
Laboratory notebooks: _____ (17) _____

Sampling and Analysis Information (1)

[*For the following, when applicable, enter procedure title(s), number(s), and date(s)*]

Radiography: _____ (18) _____
Visual examination: _____ (18) _____

Headspace Gas Analysis

VOCs: _____ (19) _____
Flammable: _____ (19) _____
Other gases (specify): _____ (19) _____

Homogeneous Solids/Soils/Gravel Sample Analysis

Total metals: _____ (20) _____
PCBs: _____ (20) _____
VOCs: _____ (20) _____
Nonhalogenated VOCs: _____ (20) _____
Semi-VOCs: _____ (20) _____
Other (specify): _____ (20) _____

Waste Stream Profile Form certification:

I hereby certify that I have reviewed the information in this Waste Stream Profile Form, and it is complete and accurate to the best of my knowledge. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

_____ (21) _____
SPM Signature Printed Name and Title Date

NOTE:

(1) *Use back of sheet or continuation sheets, if required.*

(2) *If radiography, visual examination, headspace gas analysis, and/or homogeneous solids/soils/gravel sample analysis were used to determine EPA Hazardous Waste Codes, attach signed Characterization Information Summary documenting this determination.*

B1 WASTE CHARACTERIZATION SAMPLING METHODS

The CCP characterizes TRU waste for shipment to WIPP by using the following methods for characterization of TRU waste. These methods include requirements for headspace gas sampling, sampling of homogeneous solids and soil/gravel, and radiography or VE. This section describes these methods, QC requirements, and sample control requirements.

B1-1 Headspace Gas Sampling

The CCP utilizes two on-line systems in the sampling and analysis of headspace gas samples. The CCP does not currently expect to implement a direct canister sampling method; however, the direct canister sampling requirements are addressed in this QAPjP should the need for direct canister sampling arise.

One system, operated under CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold*, is a multi-sample on-line integrated sampling/analysis system. A manifold is used to collect samples in Silco steel passivated sample holding areas that are cleaned in accordance with the cleaning requirements of Section B1-1c. The manifold inlet valve includes a changeable filter connected to either a side port needle sampling head for penetrating carbon-composite filters, or standard needles for penetrating the drum lid punch/screw system.

The second system, operated under CCP-TP-007, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure*, and CCP-TP-029, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration*, is an on-line system that automatically collects a representative sample of drum headspace gas through an on-line piping manifold connected directly to a gas chromatography (GC) and mass spectrometer (MS). A proprietary filter/drill assembly is used to penetrate the drum lid.

B1-1a Method Requirements

Headspace gas sampling is performed in radiation containment areas on waste containers that are in compliance with container equilibrium requirements (i.e., 72 hours at 18 degrees Celsius [°C] or higher). All waste containers (or randomly selected containers from waste streams that meet the conditions for reduced headspace gas sampling listed in Section B-3a(1)) designated as Summary Category Group S5000 (debris waste) are sampled for headspace gas at least 142 days after packaging or venting. All waste containers or randomly selected containers from waste streams that meet the conditions for reduced headspace gas sampling listed in Section B-3a(1) designated as Summary Categories Groups S3000 (Homogeneous Solids) and S4000 (Soil/Gravel) are sampled a minimum of 225 days after packaging. This drum age criterion ensures that drum contents have reached 90 percent of their steady state concentration within each layer of

confinement (Lockheed 1995). The equilibrium time and drum age of containers from which a headspace gas sample is collected are documented in headspace gas sampling documents maintained by sampling personnel. Waste containers with unvented rigid containers greater than 4 liters (L) (except for Waste Material Type II.2 packaged in a metal container) are either subject to sampling of the innermost layer of containment or vented prior to initiating drum age and equilibrium criteria. Headspace gas samples are analyzed for the compounds listed in Table B3-2.

The CCP requires personnel to collect samples in SUMMA® or equivalent canisters using standard headspace-gas sampling methods that meet the general guidelines established by the U.S. Environmental Protection Agency (EPA) in the Compendium Method TO-14, Redetermination of Volatile Organic Compounds (VOC) in Ambient Air using Summa Passivated Canister Sampling and Gas Chromatography Analysis (EPA 1988) or by using on-line integrated sampling/analysis systems. Samples ——— are directed to an analytical instrument instead of being collected in SUMMA® or equivalent canister when the single-sample on-line integrated sampling/analysis system is used. When the ~~a~~ multi-sample on-line integrated sampling/analysis system is used, samples ——— are directed to an integrated holding area that meets the cleaning requirements of Section B1-1c(1). The leak proof and inert nature of the integrated holding area interior surface ——— is demonstrated and documented. Samples are not transported to another location when using on-line integrated sampling/analysis system; therefore, the sample custody requirements of Section B1-4 and B1-5 do not apply. The same sampling manifold and sampling heads are used with on-line integrated sampling/analysis systems and all of the requirements associated with sampling manifolds and sampling heads ——— are met. However, when using an on-line integrated sampling and analysis system, the sampling batch and analytical batch quality control (QC) samples are combined as on-line batch QC samples as outlined in Section B1-1b.

B1-1a(1) Manifold Headspace Gas Sampling

One of the CCP headspace-gas sampling protocols employs a multiport manifold capable of collecting multiple headspace samples for analysis and QC purposes. Another is a single-sample on-line manifold. The manifolds are used to collect samples in Silco steel (or equivalent) sample canisters, holding areas, or as part of an on-line integrated sampling and analysis system. The sampling equipment is leak checked and cleaned prior to first use and as needed thereafter. The manifolds and sample canisters are evacuated to 0.0039 inches (in.) (0.10 millimeters [mm] mercury (Hg) prior to sample collection. Cleaned and evacuated sample holding areas are attached to the evacuated manifold before the manifold inlet valve is opened. The manifold inlet valve is attached to a changeable filter connected to either a side port needle sampling head (for penetrating a filter), or a sampling head with an airtight seal for sampling through an existing filter vent hole, or a drum punch sampling head (capable of punching through the metal lid of a drum).

The manifolds are equipped with a purge assembly that allows applicable QC samples to be collected through all sampling components that affect compliance with the QAOs. The CCP demonstrates and documents the effectiveness of the sampling equipment design to meet the QAOs. Field blanks are samples of room air collected in the sampling area in the immediate vicinity of the waste container to be sampled. If using gas sample canisters, field blanks are collected directly into the canister without the use of the manifold.

The manifolds, the associated sampling heads, and the headspace-gas sample volume requirements are designed to ensure that a representative sample is collected. The manifold internal volume is calculated and documented in a field logbook dedicated to headspace-gas sample collection. The total volume of headspace gases collected during each sampling operation is determined by adding the combined volume of the canisters attached to the manifold and the internal volume of the manifold. The sample volume remains small in comparison to the volume of the waste container. When an estimate of the available headspace gas volume in the drum is made, less than 10 percent of that volume is withdrawn.

The sampling manifold consists of a sample side and a standard side. The sample side is connected to the standard side for cleaning and collecting equipment blanks and field reference standards. The sample side of the sampling manifolds consists of the following major components:

- An applicable sampling head that forms a leak-tight connection with the headspace sampling manifold
- A flexible hose that allows movement of the sampling head from the purge assembly (standard side) to the waste container or QC grade stainless steel tubing with sufficient flexibility to allow any necessary movement of the sampling head
- A pressure sensor(s) that is pneumatically connected to the manifold. This manifold pressure sensor(s) is able to measure absolute pressure in the range from 0.002 in. (0.05 mm) Hg to 39.3 in. (1,000 mm) Hg. Resolution for the manifold pressure sensors is ±0.0004 in. (0.01 mm) Hg at 0.002 in. (0.05 mm) of Hg. The manifold pressure sensor(s) has an operating range from approximately 59°F (15°C) to 104°F (40°C)
- The system used with CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold*, contains 24 stainless steel sample holding areas that provide sufficient capacity to hold a batch of samples plus necessary QC samples. It allows for simultaneous collection of headspace gas samples and duplicates for VOC analysis. When using the on-line integrated sampling and analysis system, operated under CCP-TP-007, *Single Sample Manifold*

Headspace Gas Sampling and Analysis Procedure, only one port is necessary for the collection of comparison samples. Ports not occupied with sample canisters during cleaning or headspace-gas sampling activities have a plug to prevent ambient air from entering the system. In place of using plugs, the CCP may choose to install valves that can be closed to prevent intrusion of ambient air into the manifold. Ports have VCR® fittings for connection to the sample canister(s) to prevent degradation of the fittings on the canisters and manifold

- CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* uses sample holding areas that are leak-free, Silco steel passivated pressure vessels. The leak proof and inert nature of the canister interior surface is demonstrated and documented. The system, including the pressure/vacuum is helium-leak tested to 1.5×10^{-7} standard cubic centimeters per second (cc/s), has all stainless steel construction. The sample holding areas are capable of tolerating temperatures up to 125°C. The gauge range is capable of operating in the leak test range as well as the sample collection range. The system has a fitting for connecting a sample canister

- CCP-TP-007, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure* directs the headspace gas sample directly to the analytical equipment. The system is leak checked and made of stainless steel. The leak proof nature of the system is demonstrated and documented. The system has a pressure/ vacuum gauge attached to the sampling manifold. A VCR® fitting is included to allow connection of sample canisters. The system and gauge are helium-leak tested to 1.5×10^{-7} standard cubic centimeters per second (cc/s) and is capable of tolerating temperatures to 125^{o}C

- A dry vacuum pump with the ability to reduce the pressure in the manifold to 0.05 mm Hg. If a vacuum pump that requires oil is used, precautions are taken to prevent diffusion of oil vapors back to the manifold. Precautions may include the use of a molecular sieve and a cryogenic trap in series between the headspace sampling ports and the pump

- A minimum distance, based upon the design of the manifold system, between the tip of the needle and the valve that isolates the pump from the manifold in order to minimize the dead volume in the manifold

- Real-time equipment blanks are not available with the system operated under CCP-TP-029, *CCP Single Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration*, the manifold is equipped with an organic vapor analyzer (OVA) that is capable of detecting all analytes listed in Table B3-2. The OVA is capable of measuring total VOC concentrations below the lowest headspace gas PRQL. The OVA measurement is confirmed by the collection of equipment blanks at the frequency specified in Section B1-1 to check for manifold cleanliness

The standard side consists of the following major elements:

- A cylinder of compressed zero air, helium, argon, or nitrogen gas to clean the manifold between samples and to provide gas for the collection of equipment blanks or on-line blanks. These high-purity gases are certified by the manufacturer to contain less than one part per million (ppm) total VOCs. The gases are metered into the standard side of the manifold using devices that are corrosion proof and that do not allow for the introduction of manifold gas into the purge gas cylinders or generator. Alternatively, if a zero air generator is used, a sample of the zero air is collected and demonstrated to contain less than one ppm total VOCs. Zero air from a generator is humidified

- The standard side includes cylinders of field-reference standard gases or on-line control sample gases. These cylinders provide gases for evaluating the accuracy of the headspace-gas sampling process. Each cylinder of field-reference gas or on-line control sample gas has a flow-regulating device. The field-reference standard gases or on-line control sample gas is certified by the manufacturer to contain analytes from Table B3-2 of Permit Attachment B3 at known concentrations

- A humidifier filled with American Society for Testing and Materials (ASTM) Type II water, connected, and opened to the standard side of the manifold between the compressed gas cylinders and the purge assembly ~~shall be~~is used. Dry gases flowing to the purge assembly ~~will~~ pick up moisture from the humidifier. Moisture is added to the dry gases to condition the equipment blanks and field-reference standards and to assist with system cleaning between headspace-gas sample collection

  NOTE: *Caution should be exercised to isolate the humidifier during the evacuation of the system to prevent flooding the manifold. In lieu of the humidifier, the compressed gas cylinders (e.g., zero air and field-reference standard gas) may contain water vapor in the concentration range of 1,000 to 10,000 parts per million by volume (ppmv).*

- A purge assembly that allows the sampling head (sample side) to be connected to the standard side of the manifold. This connection is used to transfer gases from the compressed gas cylinders to the canisters or on-line analytical instrument. This connection is also used with CCP-TP-007, *CCP Single Manifold Headspace Gas Sampling and analysis Procedure* for system cleaning. The system operated under CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold* has a compressed gas bottle to allow for the injection of on-line control standards into the sampling assembly

- A flow-indicating device or a pressure regulator that is connected to the purge assembly to monitor the flow rate of gases through the purge assembly. The flow rate or pressure through the purge assembly is monitored to assure that excess flow exists during cleaning activities and during QC sample collection. Maintaining excess flow prevents ambient air from contaminating the QC samples and allows samples of gas from the compressed gas cylinders to be collected near ambient pressure

In addition to a manifold consisting of a sample side and a standard side, the area in which the manifold is operated contains sensors for measuring ambient pressure and ambient temperature, as follows:

- The ambient-pressure sensor has a sufficient measurement range for the ambient barometric pressures expected at the sampling location. It is kept in the sampling area during sampling operations. Its resolution is 0.039 in. (1.0 mm) Hg or less. Calibration of the sensor used with the system operated under CCP-TP-029, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration* is performed by the manufacturer is based on National Institute of Standards and Technology (NIST), or equivalent, standards. The system used with CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* performs calibration in-house using NIST, or equivalent, standards

- The temperature sensor has a sufficient measurement range for the ambient temperatures expected at the sampling location. The measurement range of the temperature sensor is from 18°C to 50°C. The temperature sensor calibration is traceable to NIST, or equivalent, standards

B1-1a(2) Direct Canister Headspace Gas Sampling

The CCP does not currently use the direct canister headspace gas sampling. If the CCP initiates this method of sampling, the following will be incorporated into technical procedures.

This headspace-gas sampling protocol employs a canister-sampling system to collect headspace-gas samples for analysis and QC purposes without the use of the manifold described above. Rather than attaching sampling heads to the manifold, the sampling heads are attached directly to an evacuated sample canister.

Canisters shall be evacuated to 0.0039 in. (0.10 mm) Hg prior to use and attached to a changeable filter connected to the appropriate sampling head. The sampling head(s) must be capable of punching through the metal lid of the drums, usinge a sampling head with an airtight seal for sampling through the existing filter vent hole, or penetrating a filter to obtain the drum headspace samples. Field duplicates must be collected at the same time, in the same manner, and using the same type of sampling apparatus as used for headspace-gas sample collection. Field blanks shall be samples of room air collected in the immediate vicinity of the waste-drum sampling area prior to removal of the drum lid. Equipment blanks and field-reference standards shall be collected using a purge assembly equivalent to the standard side of the manifold described above. These samples shall be collected from the needle tip through the same components (e.g., needle and filter) that the headspace-gas samples pass through.

The sample canisters, associated sampling heads, and the headspace-sample volume requirements ensure that a representative sample is collected. When an estimate of the available headspace-gas volume of the waste container is made, less than 10 percent of that volume should be withdrawn. A determination of the sampling head internal volume shall be made and documented. The total volume of headspace gases collected during each headspace gas sampling operation can be determined by adding the volume of the sample canister(s) attached to the sampling head to the internal volume of the sampling head. Every effort shall be made to minimize the internal volume of sampling heads.

Each sample canister used has a pressure/vacuum gauge capable of indicating leaks and sample collection volumes. Canister gauges are intended to be gross leak-detection devices, not vacuum-certification devices. If a canister pressure/vacuum gauge indicates an unexpected pressure change, determination of whether the change is a result of ambient temperature and pressure differences or a canister leak shall be made. This gauge shall be helium-leak tested to 1.5×10^{-7} standard cc/s, have all stainless steel construction, and shall be capable of tolerating temperatures to 125°C.

The SUMMA® or equivalent sample canisters as specified in EPA's Compendium Method TO-14 (EPA 1988) shall be used when sampling each drum. These heads shall form a leak-tight connection with the canister and allow sampling through the drum-lid filter, through the drum lid itself (by punching), or using an airtight seal to collect a sample through the existing filter vent hole.

B1-1a(3) Sampling Heads

A sample of the headspace gas directly under the drum lid is collected from within the drum. Three methods: sampling through the filter; sampling through the drum lid; and sampling through a filter vent hole have been developed for collecting a representative sample. The chosen sampling method preserves the integrity of the drum to contain radionuclides (e.g., replace the damaged filter, seal the punched drum lid).

B1-1a(3)(i) Sampling Through the Filter

To sample the drum-headspace gas through the drum's filter, a side-port needle (e.g., a hollow needle sealed at the tip with a small opening on its side close to the tip) is pressed through the filter and into the headspace beneath the drum lid. The gas is then drawn into the manifold or canister. The system operated under CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* uses a needle manually inserted by an operator. The system operated under CCP-TP-007, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure* does not sample through the filter. To assure that the sample collected is representative, all of the general method requirements, sampling apparatus requirements, and QC requirements described in this section are met in addition to the following requirements that are pertinent to drum headspace-gas sampling through the filter:

- The lid of the drum's 90-mil poly liner contains a hole for venting to the drum. A representative sample is not collected until the poly liner has been vented to the drum. If headspace-gas samples are collected prior to venting the 90-mil poly liner, the sample is not accepted and a nonconformance report is prepared, submitted, and resolved. Nonconformances are addressed in Section B3-13

- For sample collection, the drum's filter is sealed to prevent outside air from entering the drum and diluting and/or contaminating the sample

The sampling head for collecting drum headspace by penetrating the filter consists of a side-port needle, a filter to prevent particles from contaminating the gas sample, and an adapter to connect the side-port needle to the filter. To prevent cross contamination, the sampling head is purged after sample collection, after field-reference standard collection, and after field-blank collection. The following requirements are met:

- The housing of the filter allows insertion of the sampling needle through the filter element into the drum headspace

- The side-port needle is used to reduce the potential for plugging

- The purge assembly has been modified for compatibility with the side-port needle

B1-1a(3)(ii) Sampling Through the Drum Lid

A sample is obtained through the drum lid at the time of drum punching or shortly thereafter by breaching the lid using an appropriate drill bit, punch, or screw. (CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* uses a self-tapping screw, while CCP-TP-007, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure,* uses a drill/filter assembly). The drill bit forms an airtight seal between the drum lid and the sampling head. To ensure that the sample collected is representative, all of the general method requirements, sampling apparatus requirements, and QC requirements specified in EPA's Compendium Method TO-14 (EPA 1999a), as appropriate, are met, in addition to the following requirements:

- The seal between the drum lid and sampling head minimizes intrusion of ambient air
- All components of the sampling system that come into contact with sample gases are purged with humidified zero air, nitrogen, or helium prior to sample collection. Because the sampling needle used in CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* is inserted completely through the screw, only the sampling needle comes in contact with the gas being sampled
- Equipment blanks and field reference standards are collected through the same components of the drill bit that contact the headspace gas sample
- Pressure and drill rotation are applied to the drill bit until the drum lid has been breached (CCP-TP-007, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure*). Twisting and downward pressure is applied to the screw until the drum lid has been breached (CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold*). No air pressure is applied to the screw or into the drum, eliminating any need to relieve air pressure from the drum
- Excessive drum pressure increases are released during sampling operations (potential pressure increases may occur during sealing of the drill bit to the drum lid) (CCP-TP-007, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure* only)

- The lid of the drum's 90-mil poly liner contains a hole for venting to the drum. The sample is not collected until the poly liner has been vented to the drum. If headspace gas samples are collected prior to venting the 90-mil poly liner, the sample is not acceptable and a nonconformance report is prepared, submitted, and resolved. Nonconformance procedures are outlined in Section B3-13

- During sampling, the drum's filter, if present, is sealed to prevent outside air from entering the drum

- With CCP-TP-007, *Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure*, a flow-indicating device or pressure regulator (to verify the flow of gases) is pneumatically connected to the sampling assembly and is monitored to assure that excess flow exists during cleaning activities and QC sample collection and operated in the same manner as the flow-indicating device described above in Section B1-1a(1). Because the screw is used only as an entrance port with CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,*, and the flow indicating device of Section B1-1a(1) is used to measure flow of sample gas while collecting samples, no special flow indicating device or pressure regulator is needed

- The drill bit sampling system used in CCP-TP-007, *Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure* is secured to the drum lid. The self-tapping screw used with CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* secures itself to the drum lid

B1-1a(3)(iii) Sampling Through an Existing Filter Vent Hole

The CCP does not currently use sampling through an existing filter vent hole. If this method is initiated, the CCP will incorporate the following requirements in a technical procedure.

When sampling through an existing filter vent hole an appropriate airtight seal will be~~is~~ maintained. The sampling apparatus form an airtight seal between the container surface and the manifold or direct canister sampling equipment. To assure that the sample collected is representative, all of the general method, sampling apparatus, and QC requirements specified in EPA's Compendium Method TO-14 (EPA 1988) as appropriate, will be met in addition to the following requirements:

- The seal between the container surface and sampling apparatus shall be designed to minimize intrusion of ambient air

- The filter shall be replaced as quickly as is practicable with the airtight sampling apparatus to ensure that a representative sample can be taken

- All components of the sampling system that come into contact with sample gases shall be cleaned according to requirements for direct canister sampling or manifold sampling, whichever is appropriate, prior to sample collection

- Equipment blanks and field reference standards shall be collected through all the components of the sampling system that contact the headspace-gas sample

- The lid of the container's 90–mil poly liner shall contain a hole for venting to the container. A representative sample cannot be collected until the poly liner is vented to the container. If headspace-gas samples are collected prior to venting the 90–mil poly liner, the sample is not accepted and a nonconformance report shall be prepared, submitted, and resolved. Nonconformance procedures are outlined in Section B3-13. Note, as an option, the same gas-tight seal sampling apparatus may include a needle to penetrate the rigid liner

- During sampling, openings in the container shall be sealed to prevent outside air from entering the container

- A flow-indicating device shall be connected to sampling system and operated according to the direct canister or manifold sampling requirements, as appropriate

B1-1b Quality Control

For on-line integrated sampling and analysis systems and direct canister systems, field QC samples are collected and analyzed on an on-line batch or sampling batch basis. Holding temperatures and container requirements for gas sample containers are provided in Table B1-1. An on-line batch is the number of headspace gas samples collected within a twelve-hour period using the same on-line system. A sampling batch is a suite of samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding QC samples), all of which are collected within 14 days of the first sample in the batch. For on-line systems, QC samples are collected and analyzed on a per on-line batch basis. The analytical batch requirements are specified by the analytical method used with the on-line system (in this case GC/MS). Table B1-2 summarizes headspace gas QC sample collection requirements, while Table B1-3 presents QC sample acceptance criteria.

For the on-line integrated sampling and analysis system, the on-line batch QC samples serve as combined sampling and analytical batch QC samples as follows:

- The on-line blank replaces the equipment blank and laboratory blank

- The on-line control sample replaces the field reference standard and laboratory control sample (LCS)

- The on-line duplicate replaces the field duplicate and laboratory duplicate

The acceptance criteria for online batch QC samples are the same as for the sampling batch and analytical batch QC samples they replace. A separate field blank is collected and analyzed for each on-line batch. Acceptance criteria are shown in Table B1-3. Under CCP-TP-029, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration*, a separate field blank is collected and analyzed for each on-line batch, but if the results of a field blank collected through the sampling head meets the acceptance criterion, a separate on-line blank is not collected. Under CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* the on-line field blank is referred to as an on-line blank. Section B3-2 provides a more detailed description of the headspace gas sampling and analysis QAOs.

The data generation level QA officer and SPQAO monitor and document field QC sample results. An NCR is initiated and resolved if acceptance or frequency criteria are not met. The SPM ensures appropriate corrective action is taken.

B1-1b(1) Field Blanks

Field blanks are collected to evaluate background levels of program-required analytes. Field blanks are collected prior to sample collection, and at a frequency of one per sampling batch. In CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* on-line blanks (which is the on-line field blank) are used to evaluate background levels of program-required analytes and is collected at the same frequency as field blanks. The SPM uses the field blank data to assess impacts of ambient contamination, if any, on the sample results. Field blank results determined by gas chromatography/mass spectrometry and gas chromatography/flame ionization detection are acceptable if the concentration of each VOC analyte is less than or equal to three times the method detection limit (MDL) listed in Table B3-2. An NCR is initiated and resolved if the final reported QC sample results do not meet the acceptance criteria.

B1-1b(2) Equipment Blanks

Equipment blanks are collected to assess cleanliness prior to first use after cleaning of all sampling equipment. For the on-line integrated sampling and analysis system, on-line blanks replace equipment blanks. On-line blanks are used to assess both equipment cleanliness and analytical contamination. After the initial cleanliness check, equipment blanks are collected through the manifold once per on-line sampling batch for VOC analysis or once per day, whichever is more frequent. If the direct canister method is used, field blanks may be used in lieu of equipment blanks. The SPM uses on-line or equipment blank data to assess impacts of potentially contaminated sampling equipment on sample results. On-line blank and equipment acceptance criteria are listed in Table B1-3.

B1-1b(3) On-Line Control Samples and Field Reference Standards

Field reference standards are used to assess the accuracy with which the sampling equipment collects VOC samples into canisters prior to first use of the sampling equipment. For on-line integrated sampling and analysis systems, on-line control samples replace field reference standards and laboratory control samples. The on-line control sample is used to assess the accuracy with which the sampling equipment collects VOC samples and as an indicator of the analytical accuracy of the on-line sampling system. On-line control samples and field reference standards contain a minimum of six of the analytes listed in Table B3-2 at concentrations within 10 to 100 parts per million volume (ppmv) and greater than the MDL for each compound. On-line control samples and field reference standards are traceable to a nationally recognized standard (e.g., NIST) or, if commercial gases are used, a Certificate of Analysis from the manufacturer documenting traceability is obtained. Commercial stock gases are not used beyond their manufacturer-specified shelf life. On-line control sample acceptance criteria are listed in Table B1-3. After the initial accuracy check, on-line control samples and field reference standards are collected at a frequency of one per sampling batch. For the direct canister method, field reference standard collection may be discontinued if the filed reference standard results demonstrate the QAOs for accuracy specified in Table B1-3.

B1-1b(4) On-Line Duplicates and Field Duplicates

On-line duplicate samples are collected sequentially and in accordance with Table B1-3 to assess the precision with which the sampling procedure can collect samples. Field duplicates are collected sequentially and in accordance with Table B1-1 to assess the processes with which the sampling procedure can collect samples into canisters. The duplicates also serve as a measure of analytical precision for the on-line sampling system. On-line duplicate acceptance criteria are listed in Table B1-3.

B1-1c Equipment Testing, Inspection, and Maintenance

Sampling equipment components that come into contact with headspace sample gases are constructed of relatively inert materials such as stainless steel with passivated interior surface or Teflon®. The system operated under CCP-TP-007, *Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure* uses stainless steel components that are cleaned, passivated, or procured as gas chromatography-grade.

To minimize the potential for cross contamination of samples, the headspace sampling equipment (manifold and canisters) are properly cleaned and leak-checked prior to each sampling event. Procedures used for cleaning sampling equipment are consistent with those provided in EPA's Compendium Method TO-14 (EPA 1988) and comply with this section.

B1-1c(1) Headspace-Gas Sample Holding and Gas Sample Canister Cleaning

This section is not applicable for the system approved under CCP-TP-007, *Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure*. Silco steel passivated sample holding areas (used in CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold*) or gas canisters used with the direct canister method are subjected to a rigorous cleaning procedure prior to use in the collection of any samples. Guidance for the development of this procedure is derived from Method TO-14. Specific detailed instructions are provided in CCP procedures for the cleaning of the manifold sample holding area or will be developed for canisters if the direct canister sampling method is implemented.

Sample holding areas are cleaned and certified as an integral unit of the multi-sample on-line integrated sampling and analysis system (equivalent to an equipment cleaning batch). The cleaning system, capable of cleaning multi-sample on-line integrated sampling and analysis system, an integral unit, has a vacuum manifold which uses a dry vacuum pump to clean Silco steel passivated sample holding areas. The development of the leak test is greater than or equal to the time it takes to collect a sample, but not greater than 24 hours. Prior to cleaning, a leak test is performed on the integrated sampling system, including sample holding areas. Any failure results in a check for leaks, repair, and reprocessing. At the completion of the leak test and cleaning cycle, and before samples are collected, an equipment blank is analyzed for VOCs. The manifold and sample holding areas are considered clean and are certified if the equipment blank contains no VOCs above three time the MDLs listed in Table B3-2 of Section B3.

When the direct canister method is implemented, canisters shall be cleaned and certified on an equipment cleaning batch basis. An equipment cleaning batch will be any number of canisters cleaned together at one time using the same cleaning method. A cleaning system, capable of processing multiple canisters at one time, composed of an oven (optional) and a vacuum manifold which uses a dry vacuum pump or a cryogenic trap backed by an oil sealed pump shall be used to clean SUMMA® or equivalent canisters. Prior to cleaning, a positive or negative pressure leak test shall be performed on all canisters. The duration of the leak test must be greater than or equal to the time it takes to collect a sample, but not greater than 24 hours. For a leak test, a canister passes if the pressure does not change by more than ±2 psig per 24 hours. Any canister that fails shall be checked for leaks, repaired, and reprocessed. One canister per equipment cleaning batch shall be filled with humid zero air or humid high purity nitrogen and analyzed for VOCs. The equipment cleaning batch of canisters shall be considered clean if there are no VOCs above three times the MDLs listed in Table B3-2. After the canisters have been certified for leak-tightness and found to be free of background contamination, they shall be evacuated to 0.0039 in. (0.10 mm) Hg or less for storage prior to shipment. The CCP shall maintain certification documentation and initiates the canister tags as described in Section B3, as appropriate.

B1-1c(2) Sampling Equipment Initial Cleaning and Leak Check

The surfaces of headspace gas sampling equipment components that come into contact with headspace gas are thoroughly inspected and cleaned prior to assembly. The sampling heads are purged with humidified zero air, nitrogen, or helium, and leak checked after assembly. This cleaning is repeated if the sampling heads are contaminated to the extent that the routine system cleaning is inadequate.

B1-1c(3) Sampling Equipment Routine Cleaning and Leak Check

The sampling heads (and manifold used with CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold*) that are reused are cleaned and checked for leaks in accordance with the cleaning and leak check procedures described in EPA's Compendium Method TO-14 (EPA 1988), including cleaning with solvent, rinsing, drying, and sampling system purging. The procedures are conducted after headspace gas and on-line or field duplicate collection through the manifold; after field blank collection; and after the additional cleaning required for on-line control sample collection is completed. The protocol for routine cleaning and leak check requires that sampling ports be capped or closed by valves and that the sampling heads be attached to the purge assembly.

VOCs are removed from the internal surfaces of the headspace sampling equipment to levels less than or equal to three times the MDLs of the analytes listed in Table B3-2, as determined by analysis of an on-line blank (CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold*) or through use of an OVA (CCP-TP-007, *Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure*) or equipment blank. As recommended, the headspace sampling equipment is typically heated to 150°C and periodically evacuated and flushed with humidified zero air, nitrogen, or helium. When not in use, the sampling equipment is demonstrated clean before storage with a positive pressure of high purity gas (i.e., zero air, nitrogen, or helium) in both the standard and sample sides.

Sampling is suspended and corrective actions are taken when the analysis of an on-line or equipment blank indicates that the VOC limits have been exceeded or if a leak test fails. The SPM ensures that corrective action is taken prior to resumption of sampling.

B1-1c(4) Manifold Cleaning After On-Line Control Sample Collection

The sampling system is specially cleaned after an on-line control standard is collected because the field reference standard gases contaminate the standard side of the headspace sampling manifold when they are regulated through the purge assembly.

For CCP-TP-029, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration*, the system is designed to automatically flush the entire system (evacuate and pressurize with humidified zero nitrogen) and adequately clean the system's internal surfaces. After completing this protocol, and prior to collecting another sample, the system cleaning is verified using the OVA and a leak check is also performed.

For CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* the sampling system is cleaned after an on-line control sample has been produced by purging the system with humidified zero air or humidified nitrogen. The sampling head assembly is attached to the purge assembly and both the standard and sampling side are purged. After this purging operation, a routine leak check and routine system cleaning is performed prior to collecting additional samples.

B1-1c(5) Sampling Head Cleaning

To prevent cross contamination, the needle or airtight seal, adapters, and filter of the sampling heads are cleaned in accordance with the cleaning procedures described in EPA's Compendium Method TO-14 (EPA 1988). After sample collection, a sampling head is disposed or cleaned in accordance with Compendium Method TO-14 (EPA 1988) prior to re-use.

As a further QC measure for the system operated under CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* the needle or airtight seal and filter, after cleaning, is purged with zero air, nitrogen, or helium, and capped for storage to prevent sample contamination by VOCs potentially present in ambient air.

CCP-TP-029, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration* is designed to automatically flush the entire system (evacuate and pressurize with humidified zero nitrogen) and adequately clean the systems' internal surfaces. After completing this protocol and prior to collecting another sample, the system cleaning is verified using the OVA and leak checking the system.

B1-1d Equipment Calibration and Frequency

Pressure sensors are certified prior to initial use and annually thereafter using NIST traceable, or equivalent, standards. If necessary, the pressure indicated by the pressure sensors is temperature compensated. The pressure sensor used with CCP-TP-007, *Single-Sample Manifold Headspace Gas Sampling and Analysis Procedure* is self-compensating for temperature and does not require temperature compensation. The ambient air temperature sensor is certified prior to initial use and annually thereafter to NIST traceable, or equivalent, temperature standards.

The OVA used with CCP-TP-029, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration* is calibrated once per day, prior to first use, or as necessary according to the manufacturer's specifications. Calibration gases are certified to contain known analytes from Table B3-2 at known concentrations. The balance of the OVA calibration gas is consistent with the purge gas when the OVA is used (i.e., zero air, nitrogen, or helium). For CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold,* real-time equipment cleaning results are obtained, and an OVA is not used.

B1-2 Sampling of Homogeneous Solids and Soil/Gravel

CCP does not currently sample Summary Category Groups S3000 and S4000. If sampling of these Summary Category Groups is required, the CCP will incorporate the following requirements into technical procedures.

B1-2a Method Requirements

The CCP will ensures that methods used to collect samples of TRU waste, classified as homogeneous solids and soil/gravel from waste containers, are such that the samples are representative of the waste from which they were taken. To minimize the quantity of investigation-derived waste, the CCP laboratories conducting the analytical work will require no more sample than is required for the analysis, based on the analytical methods. However, a sufficient number of samples will be collected to adequately represent waste being sampled. For those waste streams defined as Summary Category Groups S3000 or S4000, debris that may also be present within these wastes need not be sampled.

Samples of retrievably stored waste containers will be collected using appropriate coring equipment or other EPA approved methods to collect a representative sample. Newly generated wastes that are sampled from a process as it is generated may be sampled using EPA approved methods, including scoops and ladles, that are capable of collecting a representative sample. All sampling and core sampling will comply with the QC requirements specified in B1-2b.

B1-2a(1) Core Collection

Coring tools will be used to collect cores of homogeneous solids and soil/gravel from waste containers, when possible, in a manner that minimizes disturbance to the core. A rotational coring tool (i.e., a tool that is rotated longitudinally), similar to a drill bit, to cut, lift the waste cuttings, and collect a core from the bore hole, will beis used to collect sample cores from waste containers. For homogeneous solids and soil/gravel that are relatively soft, non-rotational coring tools may be used in lieu of a rotational coring tool.

The following requirements will apply to the use of coring tools:

- Each coring tool shall contains a removable tube (liner) that is constructed of fairly rigid material unlikely to affect the composition or concentrations of target analytes in the sample core. Materials used for coring device sleeves will be constructed of polycarbonate, teflon, or glass for most samples, and stainless steel or brass if samples are not to be analyzed for metals. Analytes of concern will not be present in liner material used for coring by the CCP. Materials to be used are unlikely to affect sample results and will be documented through the collection and analysis of an equipment blank prior to first use as specified in Section B1-1b(2). Liner outer diameter will be recommended to be no more than 2 in. and no less than one in. Liner wall thickness will be recommended to be no greater than 1/16 in. Before use, the liner will be cleaned in accordance the requirements in Section B1-2b. The liner will fit flush with the inner wall of the coring tool and will be of sufficient length to hold a core that will be representative of the waste along the entire depth of the waste. The depth of the waste will be calculated as the distance from the top of the sludge to the bottom of the drum (based on the thickness of the liner and the rim at the bottom of the drum). The liner material will have sufficient transparency to allow visual examination of the core after sampling. If sub-sampling is not conducted immediately after core collection and liner extrusion, then end caps constructed of material unlikely to affect the composition or concentrations of target analytes in the core (e.g., Teflon®) will be placed over the ends of the liner. End caps will fit tightly to the ends of the liner. The CCP will requires procedures to indicate the acceptable materials for core liners and end caps

- A spring retainer will be used with each coring tool when the physical properties of the waste are such that the waste may fall out of the coring tool's liner during sampling activities. The spring retainer will be constructed of relatively inert material (e.g., stainless steel or Teflon®) and its inner diameter will not be less than the inner diameter of the liner. Before use, spring retainers will be cleaned in accordance with the requirements in Section B1-2b

- Coring tools may have an air-lock mechanism that opens to allow air inside the liners to escape as the tool is pressed into the waste (e.g., ball check valve). If used, this air-lock mechanism also closes when the core is removed from the waste container

- After disassembling the coring tool, a device (extruder) to forcefully extrude the liner from the coring tool will be used if the liner does not slide freely. All surfaces of the extruder that may come into contact with the core will be cleaned in accordance with the requirements in Section B1-2(b) prior to use

- Coring tools will be of sufficient length to hold the liner and will be constructed to allow placement of the liner leading edge as close as possible to the coring tools leading edge

- All surfaces of the coring tool that have the potential to contact the sample core or sample media will be cleaned in accordance with the requirements in Section B1-2(b) prior to use

- The leading edge of the coring tools may be sharpened and tapered to a diameter equivalent to, or slightly smaller than, the inner diameter of the liner to reduce the drag of the homogeneous solids and soil/gravel against the internal surfaces of the liner, thereby enhancing sample recovery

- Rotational coring tools will have a mechanism to minimize the rotation of the liner inside the coring tool during coring activities, thereby minimizing physical disturbance to the core

- Rotational coring will be conducted in a manner that minimizes transfer of frictional heat to the core, thereby minimizing potential loss of VOCs

- Non-rotational coring tools will be designed such that the tool's kerf width is minimized. Kerf width will be defined as one-half of the difference between the outer diameter of the tool and the inner diameter of the tool's inlet

B1-2a(2) Sample Collection

Sampling of cores will be conducted in accordance with the following requirements:

- Sampling will be conducted as soon as possible after core collection. If a substantial delay (i.e., more than 60 minutes) is expected between core collection and sampling, the core remains in the liner and the liner is capped at each end. If the liner containing the core is not extruded from the coring tool and capped, then the liner will be left in the coring tool and the coring tool will be capped at each end

- Samples of homogeneous solids and soil/gravel for VOC analyses will be collected prior to extruding the core from the liner. These samples may be collected by collecting a single sample from the representative subsection of the core, or three sub-samples may be collected from the vertical core to form a single 15-gram composite sample. Smaller sample sizes may be used if method PRQL requirements are met for all analytes. The sampling locations will be randomly selected. If a single sample is used, the representative subsection will be chosen by randomly selecting a location along the portion of the core (i.e., core length). If the three sub-sample method is used, the sampling

locations will be randomly selected within three equal-length subsections of the core along the long axis of the liner and access to the waste will be gained by making a perpendicular cut through the liner and the core. The CCP will develop documented procedures to select, and record the selection, of random sampling locations by properly using random numbers for identifying sampling locations. The procedures used to select the random sampling locations will be subject to review as part of annual audits by the Permittees. A sampling device such as the metal coring cylinder described in EPA's SW-846 Manual (1996), or equivalent, will be immediately used to collect the sample once the core has been exposed to air. Immediately after sample collection, the sample will be placed in an airtight sample container for VOC analysis, the top rim of the container visually inspected and wiped clean of any waste residue, and the cap secured. Sample handling requirements are outlined in Table B1-4. Additional guidance for this type of sampling can be found in SW-846 (EPA 1996)

- Samples of the homogeneous solids and soil/gravel for semi-volatile organic compound, polychlorinated biphenyls, and metals analyses will be collected. These samples may be collected from the same sub-sample locations and in the same manner as the sample collected for VOC analysis, or they may be collected by splitting or compositing the representative subsection of the core. The representative subsection will be chosen by randomly selecting a location along the portion of the core (i.e., core length). The CCP will develop documented procedures to select, and record the selection, of random sampling locations by properly using random numbers for identifying sampling locations. The procedures used to select the random sampling locations are subject to review as part of annual audits by the Permittees. Guidance for splitting and compositing solid materials can be found in SW-846 (EPA 1996). All surfaces of the sampling tools that have the potential to come into contact with the sample will be constructed of materials unlikely to affect the composition or concentrations of target analytes in the waste (e.g., Teflon®). In addition, all surfaces that have the potential to come into contact with core sample media will be either disposed of or decontaminated according to the procedures found in Section B1-2(b). Sample sizes and handling requirements are outlined in Table B1-4

Newly generated waste samples may be collected using methods other than coring, as discussed in Section B1-2a. Newly generated wastes samples will be collected as soon as possible after sampling, but the spatial and temporal homogeneity of the waste stream dictate whether a representative grab sample or composite sample will be collected. As part of the site audit, the Permittees shall assess waste sampling to ensure collection of representative samples.

B1-2b Quality Control

QC requirements for sampling of homogeneous solids and soil/gravel include collecting co-located samples from cores or other sample types to determine precision; equipment blanks to verify cleanliness of the sampling and coring tools and sampling equipment; and analysis of reagent blanks to ensure reagents, such as deionized or high pressure liquid chromatography (HPLC) water, will be of sufficient quality. Coring and sampling of homogeneous solids and soil/gravel by the CCP will comply, at a minimum, with the following QC requirements.

B1-2b(1) Co-located Samples

In accordance with the requirement to collect field duplicates required by the EPA methods found in SW-846 (EPA 1996), samples will be collected to determine the combined precision of the coring and sampling procedures. The co-located core methodology will include a duplicate sample collection methodology intended to collect samples from a second core placed at approximately the same location within the drum when samples are collected by coring. Newly generated waste may not be amenable to coring in some instances. In this case, a co-located sample will be collected from a sample (e.g., scoop) collected from approximately the same location in the waste stream. A sample from each co-located core or newly generated waste sample collected by other means will be collected side by side as close as feasible to one another, handled in the same manner, visually inspected through the transparent liner (if cored), and sampled in the same manner at the same randomly selected sample location(s). If the visual examination detects inconsistencies such as color, texture, or waste type in the waste at the sample location, another sampling location may be randomly selected, or the samples may be invalidated and co-located samples or cores may again be collected. Co-located samples, from either core or other sample type, will be collected at a frequency of one per sampling batch or once per week, whichever is more frequent. A sampling batch will be a suite of homogeneous solids and soil/gravel samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QC samples), all of which will be collected within 14 days of the first sample in the batch.

B1-2b(2) Equipment Blanks

In accordance with SW-846 (EPA 1996), equipment blanks will be collected from fully assembled sampling and coring tools (i.e., at least those portions of the sampling equipment that contact the sample) prior to first use after cleaning at a frequency of one per equipment cleaning batch. An equipment cleaning batch will be the number of sampling equipment items cleaned together at one time using the same cleaning method. The equipment blank will be collected from the fully assembled sampling or coring tool, in the area where the sampling or coring tools will be cleaned, prior to covering with protective wrapping and storage. The equipment blank will be collected by pouring clean

water (e.g., deionized water, HPLC water) down the inside of the assembled sampling or coring tool. The water will be collected in a clean sample container placed at the leading edge of the sampling or coring tool and analyzed for the analytes listed in Tables B3-4, B3-6, and B3-8. The results of the equipment blank will be considered acceptable if the analysis indicates no analyte at a concentration greater than three times the MDLs listed in Tables B3-4 and B3-6 or in the Program Required Detection Limits (PRDL) in Table B3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling or coring tools will be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch will not be used until analytical results are received verifying an adequately low level of contamination in the equipment blank.

Equipment blanks for coring tools will be collected from liners that will be cleaned separately from the coring tools. These equipment blanks will be collected at a frequency of one per equipment cleaning batch. The equipment blanks will be collected by randomly selecting a liner from the equipment cleaning batch, pouring clean water (e.g., deionized water or HPLC water) across its internal surface, collecting the water in a clean sample container, and analyzing the water for the analytes listed in Tables B3-4, B3-6, and the PRDLs in Table B3-8. The results of the equipment blank analysis will be considered acceptable if the results indicate no analyte at a concentration greater than three times the MDLs listed in Tables B3-4, B3-6, or PRDLs in Table B3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of liners will be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch will not be used until analytical results are received verifying an adequately low level of contamination in the equipment blank.

Sampling equipment (e.g., bowls, spoons, chisel, VOC sub-sampler) will also be cleaned. Equipment blanks will be collected for the sampling equipment at a frequency of one per equipment cleaning batch. After the sampling equipment will be cleaned, one item from the equipment cleaning batch will be randomly selected, water (e.g., deionized water, HPLC water) will be passed over its surface, collected in a clean container, and analyzed for the analytes listed in Tables B3-4, B3-6, and B3-8. The results of the equipment blank will be considered acceptable if the results indicate no analyte present at a concentration greater than three times the MDLs listed in Tables B3-4 and B3-6 and in the PRDLs in B3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling equipment will be~~is~~ cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch will not be used until analytical results are received verifying an adequately low level of contamination in the equipment blank. The above equipment blanks may be performed on a purchased batch basis for sampling equipment purchased sterile and sealed in protective packaging. Equipment blanks need not be performed for equipment purchased in sealed protective packaging accompanied by a certificate certifying cleanliness.

The results of equipment blanks will be traceable to the items in the equipment cleaning batch that the equipment blank represents. All sampling items will be identified, and the associated equipment cleaning batch will be documented. The method of documenting the connection between equipment and equipment cleaning batches will be documented. Equipment blank results for the coring tools, liners, and sampling equipment will be reviewed prior to use. A sufficient quantity of these items will be maintained in storage to prevent disruption of sampling operations.

The Permittees may require a site to use certified clean disposable sampling equipment and discard liners and sampling tools after one use. In this instance, cleaning and equipment blank collection will not be required.

B1-2b(3) Coring Tool and Sampling Equipment Cleaning

Coring tools and sampling equipment shall be cleaned in accordance with the following requirements:

- All surfaces of coring tools and sampling equipment that will come into contact with the samples will be clean prior to use. All sampling equipment will be cleaned in the same manner. Immediately following cleaning, coring tools and sampling equipment will be assembled and sealed inside clean protective wrapping

- Each reusable sampling or coring tool will have a unique identification number. Each number will be referenced to the waste container on which it is used. This information will be recorded in the field records. One sampling or coring tool from each equipment cleaning batch will be tested for cleanliness in accordance with the requirements specified above. The identification number of the sampling or coring tool from which the equipment blank was collected will be recorded in the field records. The results of the equipment blank analysis for the equipment cleaning batch in which each sampling or coring tool was cleaned will be submitted to the sampling facility with the identification numbers of all sampling or coring tools in the equipment cleaning batch. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling equipment will be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch will not be used until analytical results are received verifying an adequately low level of contamination in the equipment blank

- Sample containers will be cleaned in accordance with SW-846 (EPA 1996)

B1-2c Equipment Testing, Inspection and Maintenance

Prior to initiation of sampling or coring activities, sampling and coring tools are tested in accordance with manufacturer specifications to ensure operation within the manufacturer's tolerance limits. Other specifications specific to the sampling operations (e.g., operation of containment structure and safety systems) are tested and verified as operating properly prior to initiating coring activities. Coring tools are assembled, including liners, and tested. Air-lock mechanisms and rotation mechanisms are inspected for free movement of critical parts. Sampling and coring tools found to be malfunctioning are repaired or replaced prior to use.

Coring tools and sample collection equipment are maintained in accordance with manufacturer's specifications. Clean sampling and coring tools and sampling equipment are sealed inside clean protective wrapping and maintained in a clean storage area prior to use. Sampling equipment is properly maintained to avoid contamination. A sufficient supply of spare parts is maintained to prevent delays in sampling activities due to equipment down time. Records of equipment maintenance and repair are maintained in the field records in accordance with site Standard Operating Procedures (SOPs).

Inspection of sampling equipment and work areas includes the following:

- Sample collection equipment in the immediate area of sample collection is inspected daily for cleanliness. Visible contamination on any equipment (e.g., waste on floor of sampling area, hydraulic fluid from hoses) that has the potential to contaminate a waste core or waste sample is thoroughly cleaned upon its discovery

- The waste coring and sampling work areas are maintained in clean condition to minimize the potential for cross contamination between waste (including cores) and samples

- Expendable equipment (e.g., plastic sheeting, plastic gloves) is visually inspected for cleanliness prior to use and properly discarded after each sample

- Prior to removal of the protective wrapping from a coring tool designated for use, the condition of the protective wrapping should be visually assessed. Coring tools with torn protective wrapping should be returned for cleaning. Coring tools visibly contaminated after the protective wrapping has been removed are not used and are returned for cleaning or properly discarded

- Sampling equipment is visually inspected prior to use. All sampling equipment that comes into contact with waste samples are stored in protective wrapping until use. Prior to removal of the protective wrapping from sampling equipment, the condition of the protective wrapping is visually assessed. Sampling equipment with torn protective wrapping is discarded or returned for cleaning. Sampling equipment visibly contaminated after the protective wrapping has been removed is not used and is returned for cleaning or properly discarded

- Cleaned sampling and coring equipment is physically segregated from all equipment that was used for a sampling event and was not decontaminated

B1-2d Equipment Calibration and Frequency

The scale used for weighing sub-samples is calibrated as necessary to maintain its operation within manufacturer's specification, and after repairs and routine maintenance. Weights used for calibration are traceable to a nationally recognized standard. Calibration records are maintained in the field records.

B1-3 Radiography

Radiography aids in the examination and identification of containerized waste. There is no equivalent EPA method. Personnel perform radiography in accordance with CCP-TP-011, *CCP Radiography Inspection Operating Procedure*, or CCP-TP-012, *CCP WIT Digital Radiography/Computed Tomography*. These procedures address the WAP requirements described in the following sections. Additionally, these procedures include instructions specific to the radiography method used. For example, details about moving the drum in a specific way in order to detect liquids are included in the radiography procedures. QAOs for radiography are contained in Section B3-4.

B1-3a Methods Requirements

A radiography system normally consists of the following components: X-ray-producing device; imaging system; an enclosure for radiation protection; a waste container handling system; an audio/visual recording system; and an operator control and data acquisition station. The radiography equipment has controls (or an equivalent process) that allow the operator to control image quality for materials of varying density. It is possible to vary the voltage, typically between 150-400 kilovolts, to provide an optimum degree of penetration through the waste. For example, high-density material is examined with the X-ray device set on the maximum voltage. This ensures maximum penetration through the waste container. Low-density material is examined at lower voltage settings to improve contrast and image definition. The imaging system utilizes a fluorescent screen, a low-light

television camera, or X-ray detectors to generate the image. CCP-TP-011, *CCP Radiography Inspection Operating Procedure* describes operation of a real-time radiography system. CCP-TP-012, *CCP Digital Radiography/Computed Tomography,* describes operation of digital radiography.

Computed tomography (CT) is provided for high energy (2 MeV) x-ray NDE where three-dimensional or depth plane imaging is beneficial for determining drum contents requiring depth information. The purpose of the CT is to noninvasively identify and report on drum contents, its packaging materials, and WIPP prohibited contents.

CT uses high energy x-ray NDE scanning techniques resulting in tomographic (slice plane), area projection, and volume-rendered imaging for a drum's qualitative content or matrix identification and verification.

To perform radiography, the waste container is scanned while the operator views the television screen. An audio/videotape or equivalently unalterable media is made of the waste container scan and is maintained as a Non-Permanent Record. Also, a radiography data form on which the waste matrix code and estimated waste material parameter weights are documented is included in the radiography-specific procedure. Estimated waste material parameters and weights are determined by compiling an inventory of waste items, residual materials, and packaging materials. The items on the inventory are sorted by waste material parameter and combined with a standard weight look-up table to provide an estimate of the parameter weights. Containers whose contents prevent full examination to the extent expected for the radiography technique and waste form are subject to VE.

B1-3b Quality Control

The radiography system involves qualitative and semi-quantitative evaluations of visual displays. Operator training and experience are the most important considerations for assuring QC in regard to the operation of the radiography system and for interpretation and disposition of radiography results. Only trained personnel are allowed to operate radiography equipment.

Standardized training requirements for radiographic operators is based on existing industry standard training requirements and complies with the training and qualification requirements stipulated in this document.

Formal and on-the-job training (OJT) elements are listed below. In addition, radiography personnel are instructed in the specific waste generating practices, typical packaging configurations, and associated waste material parameters expected to be found in the waste matrix code and waste stream. OJT and apprenticeship of radiography personnel are conducted by experienced, qualified radiography operators prior to qualification of training candidates. Training describes the site equipment, waste configurations, and the

level of waste characterization efforts for the CCP. In addition, radiography operators are trained on the types of waste, physical forms, packaging configurations, and QC requirements for site waste characterized by the CCP.

The radiography training program is subject to internal assessment under the CCP QA assessment program. The training program includes items required by the CCP-QP-002, *CCP Training and Qualification Plan* and the required elements listed below.

B1-3b(1) Formal Training

- Project requirements
- State and federal regulations
- Basic principles of radiography
- Radiographic image quality
- Radiographic scanning techniques
- Application techniques
- Radiography of waste forms
- Standards, codes, and procedures for radiography
- Site-specific instruction

B1-3b(2) On-the-Job Training

- System operation
- Identification of packaging configurations
- Identification of waste material parameters
- Weight and volume estimation
- Identification of prohibited items

To qualify, candidate radiographers must successfully analyze a radiography test drum initially (prior to analyzing drums in a particular waste stream for disposal characterization) and at least biannually thereafter. The test drum includes items common to the waste streams and representative of the waste matrix code to be characterized by CCP. The test drums are divided into layers with varying packing densities (or different drums may be used to represent different situations that may occur). Test drums representative of the waste matrix codes for which WSPF approval is sought must be examined and successfully identified prior to waste shipment. The radiography data are then reviewed by a supervisor trained to the same standard as the radiography operators to ensure that operators' interpretations remain consistent and accurate.

The following is a list of required elements for radiography test drums that must be successfully identified by the operator for qualification:

- Aerosol can with puncture
- Horsetail bag
- Pair of coveralls
- Empty bottle
- Irregularly shaped pieces of wood
- Empty one-gal. paint can
- Full container
- Aerosol can with fluid
- One gal. bottle with three tablespoons of fluid
- One gal. bottle with one cup of fluid (upside down)
- Leaded glove or leaded apron
- Wrench

Qualification of radiography operators, at a minimum, encompasses the following:

- Successfully pass a comprehensive exam based upon training enabling objectives. The exam addresses all of the radiography operation, documentation, characterization, and procedural elements stipulated in this QAPjP

- Perform practical capability demonstration in the presence of an appointed site radiography subject matter expert (SME). This person is an experienced radiography operator who is qualified as an OJT trainer

Requalification of operators is based upon evidence of continued satisfactory performance (primarily audio/videotape reviews) at least every two years. Unsatisfactory performance defined as the misidentification of a prohibited item in a training drum or a score of less than 80 percent on the comprehensive exam results in disqualification. Retraining and demonstration of satisfactory performance are required before a disqualified operator is again allowed to operate the radiography system.

The training drum with internal containers of various sizes is scanned biannually by each operator. The audio/videotape or equivalent media are then reviewed by a supervisor to ensure that operators' interpretations remain consistent and accurate. Imaging system characteristics are verified on a routine basis.

Independent replicate scans and replicate observations of the video output of the radiography process are performed under uniform conditions and procedures. Independent replicate scans are performed on one waste container per day or once per testing batch, whichever is less frequent. Independent observations of one scan (not the replicate scan) are made once per day or once per testing batch, whichever is less

frequent, by a qualified radiography operator other than the operator who performed the first examination. A testing batch is a suite of waste containers undergoing radiography using the same testing equipment. A testing batch can be up to 20 waste containers without regard to waste matrix.

Oversight functions include periodic audio/video tape reviews of accepted waste containers and are performed by qualified radiography personnel other than the operator who dispositioned the waste container. The results of this independent verification are available to the radiography operator. The CCP SPQAO is responsible for monitoring the quality of the radiography data and calling for corrective action, when necessary.

B1-3b(3) Visual Examination

As an additional QC check, or in lieu of radiography, the CCP verifies the waste containers contents using VE. VE is performed according to CCP-TP-013, *CCP Waste Visual Examination and Repackaging* as a QC check on a statistically selected sample of containers previously subjected to NDE as described in CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*. With the exception of potentially hazardous items or conditions, the radiography results are not made available to VE personnel until after VE is completed. Verification by VE includes the waste matrix code and waste material parameter weights. It is performed through a comparison of radiography and VE results. The waste matrix code is determined and waste material parameter weights are estimated to verify that the container is properly included in the appropriate waste stream. VE results are transmitted to the radiography facility.

VE is conducted to describe all contents of a waste container and to estimate or measure the content weights. The waste description produced by VE clearly identifies all discernible waste items, residual materials, packaging materials, or waste material parameters. CCP VE experts who are experienced, familiar with the site waste generating processes and waste types, and trained in accordance with the requirements listed below assess the need to open individual waste packages. If individual packages are not opened, estimated weights are recorded. Estimated weights are established using historically derived weight tables and estimated waste material parameter volumes. Where inner containers are sealed or cannot be properly viewed, CCP uses documented AK to identify the waste matrix code and the estimated material parameter weights. If AK is insufficient for individual bags or packages, actual weights of waste items, residual materials, packaging materials, or waste matrix parameters are recorded. VE activities are documented on video/audiotape, and the results of all VE are documented on VE report forms.

VE consists of a semi-quantitative and/or qualitative evaluation of waste container contents and is recorded on audio/videotape. The VE program provides an acceptable level of confidence in radiography. There is no equivalent method in EPA guidance documents.

Standardized training for VE includes both formal classroom training and OJT. VE personnel are instructed in the specific waste-generating processes, typical packaging configurations, and expected waste material parameters to be found in each waste matrix code characterized by the CCP. The OJT and apprenticeship are conducted by a VE operator experienced and qualified in VE prior to qualification of the candidate. The training covers the various waste configurations characterized by the CCP, including the particular physical forms and packaging configurations that may be encountered at a specific site. VE personnel are requalified once every two years. CCP training programs contain the following required training elements for VE personnel:

B1-3b(4) Formal Training

- Project requirements
- State and federal regulations
- Application techniques
- Site-specific instruction

B1-3b(5) On-the-Job Training

- Identification of packaging configurations
- Identification of waste material parameters
- Weight and volume estimation
- Identification of prohibited items

The SPM designates VE experts. Designated VE experts are familiar with the waste-generating processes that have taken place at the site and waste types for wastes being characterized at a particular site. VE experts are responsible for the overall direction and implementation of VE activities for the CCP at that site. VE experts meet the qualification and training requirements specified in this QAPjP and make decisions based on training, previous experience, and knowledge of the waste stream.

If the waste is homogeneous, the expert may decide that limited visual examination involving a confirmation of radiography data is appropriate. For heterogeneous debris waste undergoing VE, the VE expert may decide a full VE involving opening bags and segregating waste is warranted. Various degrees of segregation are possible based on the VE expert's judgement and the availability of AK data. The criteria used by VE experts to determine the degree of VE and segregation necessary are based on the ability of VE to meet the objectives for an individual container. The degree of examination is determined on the accessability of the waste, visibility through the bags or individual containers, ability to determine waste items when encountering limited visibility, and ability to establish the presence or absence of prohibited items. The basis of VE expert decisions regarding degree of segregation are documented on a VE report form.

The VE report form is used to record descriptions of the waste container contents. The waste description recorded on the form identifies the applicable waste material parameters and their estimated weights. In cases where bags are not opened, the brief written description of their contents includes an estimate of the amount of each waste material parameter in the bags. The VE report form is supplemented with audio/videotape recording.

B1-4 Custody of Samples

The CCP currently accepts Performance Demonstration Program (PDP) samples, but does not currently process homogeneous waste samples or gas canisters. If the CCP initiates a sampling program requiring transfer of waste samples the applicable requirements of this section will be incorporated in technical procedures.

Chain-of-Custody on field samples (including field QC samples) will be initiated immediately after sample collection or preparation. Sample custody will be maintained by ensuring samples are custody sealed during shipment to the laboratory. After samples are accepted by the analytical laboratory, custody will be maintained by assuring that the samples are in the possession of an authorized individual, in that individual's view, in a sealed or locked container controlled by that individual, or in a secure controlled access location. Sample custody will be maintained until the sample is released by the site project manager or until the sample is expended. The CCP procedure will contain a copy of the sample chain-of-custody form and instructions for completing sample chain-of-custody forms in a legally defensible manner. This form will includes provisions for each of the following:

- Signature of individual initiating custody control, along with the date and time
- Documentation of sample numbers for each sample under custody. Sample numbers are referenced to a specific sampling event description that identifies the sampler(s) through signature, the date and time of sample collection, type/number containers for each sample, sample matrix, preservatives (if applicable), requested methods of analysis, place/address of sample collection and the waste container number
- For off-site shipping, method of shipping transfer, responsible shipping organization or corporation, and associated air bill or lading number

  Signatures of custodians relinquishing and receiving custody, along with date and time of the transfer
- Description of final sample container disposition, along with signature of individual removing sample container from custody

- Comment section

- Documentation of discrepancies, breakage or tampering

All samples and sampling equipment will be identified with unique identification numbers. Sampling coring tools and equipment will be identified with unique equipment numbers that ensures all sampling equipment, coring tools, and sampling canisters will be traceable to equipment cleaning batches.

All samples will be uniquely identified to ensure the integrity of the sample and will be used to identify the facility and date of collection. Sample tags or labels will be affixed to all samples and identifies at a minimum:

- Sample ID number
- Sampler initials and organization
- Ambient temperature and pressure (for gas samples only)
- Sample description
- Requested analyses
- Data and time of collection
- QC designation (if applicable)

B1-5 Sample Packing and Shipping

In the event that the analytical facilities are not at the generator/storage site, the samples shall be packaged and shipped to an off-site laboratory. Sample containers shall be packed to prevent any damage to the sampling container and maintain the preservation temperature, if necessary. Department of Transportation (**DOT**) regulations shall be adhered to for shipment of the package.

When preparing SUMMA® or equivalent canisters for shipment, special care shall be taken with the pressure gauge and the associated connections. Metal boxes which have separate compartments, or cardboard boxes with foam inserts are standard shipping containers. The chosen shipping container shall meet selected DOT regulations. If temperatures shall be maintained, an adequate number of cold packs necessary to maintain the preservation temperature shall be added to the package.

Glass jars will be wrapped in bubble wrap or another type of protection. The wrapped jar should be placed in a plastic bag inside of the shipping container, so that if the jar breaks, the inside of the shipping container and the other samples will not be contaminated. The plastic bag will enable the receiving analytical lab to prevent contamination of their shipping and receiving area. Plastic jars do not present a problem for shipping purposes. All shipping containers will contain appropriate blank samples to detect any VOC cross-contamination. A DOT approved cooler, or similar package may be used as the shipping container. If temperatures must be maintained, an adequate number of cold packs

necessary to maintain the preservation temperature shall be added to the package. If fill material is needed, compatibility between the samples and the fill should be evaluated prior to use.

All sample containers should be affixed with signed tamper-proof seals or devices so that it is apparent if the sample integrity has been compromised and that the identity of the seal or device is traceable to the individual who affixed the seal. A seal should also be placed on the outside of the shipping container for the same reason. Sample custody documentation shall be placed inside the sealed or locked shipping container, with the current custodian signing to release custody. Transfer of custody will be completed when the receiving custodian opens the shipping container and signs the custody documentation. The shipping documentation will serve to track the physical transfer of samples between the two custodians.

A Uniform Hazardous Waste Manifest is not required, since samples are exempted from the definition of hazardous waste under RCRA. All other shipping documentation specified in the site specific SOP for sample shipment (i.e., bill of lading, site-specific shipping documentation) will be required.

Table B1-1 Gas Sample Requirements

Parameter	Container[a]	Minimum Drum Headspace Sample Volume	Holding Temperatures
VOCs	Silco Steel Passivated	250 ml[b]	0-40 ºC
Hydrogen & Methane	NA	100 ml	0-40 ºC

[a] Alternately, canisters that meet QAOs may be used.

[b] Alternately, if available headspace is limited, a single 100 ml sample may be collected for determination of VOCS.

Table B1-2 Summary of Container Field QC Headspace Sample Frequencies

Quality Control (QC) Samples	On-Line Systems[d]
Field Blanks[a]	1 per on-line batch
Equipment or On-Line Blanks[b]	1 per on-line batch
On-Line Control Samples[c]	1 per on-line batch
On-Line Duplicate Samples	1 per on-line batch

a Analysis of field blanks and on-line blanks is required only for Volatile Organic Compounds (VOCs) (Table B3-2). For on-line integrated sampling and analysis systems, if field blank results meet the acceptance criteria, a separate on-line blank is not required.

b One on-line blank must be collected, analyzed for VOCs, and demonstrated as clean prior to first use of the headspace gas sampling equipment with each of the sampling heads, and at the specified frequency thereafter. Analysis of an on-line blank is required only if the field blank fails to meet the Quality Assurance Objectives (QAOs) specified in Table B1-3. Daily, prior to work, the sampling manifold, if used, shall be verified clean using an OVA, or equivalent.

c One on-line control sample must be collected, analyzed, and demonstrated to meet the QAOs specified in Table B3-2 prior to first use, then at the specified frequency thereafter.

d An on-line batch is any group of samples collected within a 12-hour period using the same on-line integrated sampling and analysis system. The analytical batch requirements are specified by the analytical method being used in the on-line system.

Table B1-3 Summary of Sampling Quality Control Sample Acceptance Criteria

Quality Control (QC) Samples	Acceptance Criteria	Corrective Action[a, b]
Field Blanks	Gas Chromatography (GC)/Mass Spectrometry (MS), GC/Flame Ionization Detector (FID) Volatile Organic Compounds (VOCs) #3 x Method Detection Limits (MDLs) in Table B3-2	Nonconformance if acceptance criteria are exceeded
Equipment Blanks	GC/MS, GC/FID VOCs #3 x MDLs in Table B3-2	Nonconformance if acceptance criteria are exceeded
Field Reference Standards or On-Line Control Sample	70 - 130 Percent Recovery (%R)	Nonconformance if %R < 70 or > 130
Field Duplicate or On-Line Duplicate Sample	Relative Percent Difference (RPD) $\leq$ 25 %	Nonconformance if RPD > 25 %

[a] Corrective action is only required if the final reported QC sample results do not meet the acceptance criteria.

[b] Data usability affected by QC nonconformances is assessed in accordance with CCP-TP-001, *CCP Project Level Data Validation and Verification*.

MDL = Method Detection Limit
%R = Percent Recovery
RPD = Relative percent difference

Table B1-4 Sample Handling Requirements for Homogeneous Solids and Soil/Gravel

Parameter	Suggested Quantity[a]	Required Preservative	Suggested Container	Maximum Holding Time[b]
VOCs	15 grams	Cool to 4ºC	Glass Vial[c]	14 Days Prep/ 40 Days Analyze[d]
SVOCs	50 grams	Cool to 4ºC	Glass Jar[e]	14 Days Prep/ 40 Days Analyze[d]
Polychlorinated Biphenyls (PCBs)[f]	50 grams	Cool to 4ºC	Glass Jar[e]	14 Days Prep/ 40 Days Analyze[d]
Metals	10 grams	Cool to 4ºC	Plastic Jar[g]	180 Days[h]

[a] Quantity may be increased or decreased according to the requirements of the analytical laboratory, as long as the QAOs are met.
[b] Holding time begins at sample collection (holding times are consistent with SW-846 requirements).
[c] 40-ml VOA vial or other appropriate containers shall have an airtight cap.
[d] 40-day holding time allowable only for methanol extract - 14-day holding time for non-extracted VOCs.
[e] Appropriate containers should be used and should have Teflon® lined caps.
[f] Analysis for PCBs is required only for waste streams in Waste Matrix Code S3220 (organics sludges).
[g] Polyethylene or polypropylene preferred, glass jar is allowable.
[h] Holding time for mercury analysis is 28 days.

Note: Preservation requirements in the most recent version of SW-846 may be used if appropriate.

B2 STATISTICAL METHODS USED IN SAMPLING AND ANALYSIS

The CCP uses the following statistical methods for sampling and analysis of TRU waste to be disposed of at the WIPP. These statistical methods include methods for selecting waste containers for VE, selecting retrievably stored waste containers for totals analysis, setting the upper confidence limit and control charting for newly generated waste stream sampling.

B2-1 Approach for Statistically Selecting Waste Containers for Visual Examination

The CCP may use radiography to confirm the physical composition of each waste container and the absence of prohibited items. As a QC check on the radiographic examination of containers, the CCP performs VE on a portion of retrievably stored TRU waste containers statistically selected according to CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*. The data from VE is used to verify the waste matrix code, estimated material parameter weights, and absence of prohibited items (as identified in Section B-1c) as determined by radiography.

VE data are used to determine, with acceptable confidence, the percentage of miscertified waste containers from the radiographic examination. Miscertified containers are those that radiography indicates meet the WAC and TRAMPAC but VE indicates do not meet these criteria.

CCP initially uses an eleven-percent (11 percent) miscertification rate to calculate the number of waste containers that are visually examined until a CCP-specific miscertification rate is established. CCP establishes a CCP-specific miscertification rate by characterizing a lot of no less than fifty containers in a single Summary Category Group at the initial 11 percent miscertification rate. The results of this initial characterization then serves as the CCP specific miscertification rate until reassessed annually as described below. Miscertification rate calculations are done in accordance with CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*.

The CCP-specific miscertification rate is applied initially to each Summary Category Group to determine the number of containers in that Summary Category Group requiring VE, as specified in Table B2-1. However, a Summary Category Group-specific miscertification rate is determined when either six months have passed since radiographic characterization commenced on a given Summary Category Group or at least 50 percent of a given Summary Category Group has undergone radiographic characterization, whichever occurs first. The Summary Category Group is subject to the VE requirements of this re-evaluated Summary Category Group-specific miscertification rate to ensure that the entire Summary Category

Group is appropriately characterized. Table B2-1 provides the number of waste containers per Summary Category Group that are visually examined for various miscertification rates and waste container population sizes using a hypergeometric sampling approach. CCP uses a miscertification rate of 1 percent for any Summary Category Group-specific miscertification rate calculated to be less than 1 percent.

The CCP-specific miscertification rate is reassessed annually by calculating a drum-weighted average of all historic Summary Category Group-specific miscertification rates. Each Summary Category Group-specific miscertification rate is rounded off to the nearest integer value before being used to calculate the new CCP-specific miscertification rate. CCP uses a miscertification rate of one percent for any CCP-specific miscertification rate calculated to be less than one percent.

The statistical selection is based on the miscertification rate for waste containers within a Summary Category Group as defined in Table B2-1 and in CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*.

The number of waste containers requiring VE is based on a 90 percent confidence that the actual miscertification rate (for the population) is less than the 90 percent upper confidence limit (UCL), and an 80 percent confidence that the UCL is less than 14 percent if the actual miscertification rate is the same as the targeted percent of miscertified waste containers (column heading of Table B2-1). Thus there is only a 10 percent probability that the UCL will be below 14 percent in the case where the actual miscertification rate is 14 percent or greater. Also, there is a 20 percent probability that the UCL is above 14 percent in the case where the actual miscertification rate is the same as the targeted percent.

The hypergeometric approach to determining the number of containers to be visually examined is dependent upon the defined estimate of the allowable proportion of containers that were miscertified and information on previous percentages of containers that were miscertified. The rationale and details of this methodology are discussed below.

In a population of size N, there are M miscertified containers, so the true proportion of the miscertified containers in the population is $M/N=p_{true}$ Since p_{true} (or M) is not known, p_{true} is estimated by randomly sampling some of the containers. If, in a sample of n containers, x are found to be miscertified, the sample estimate ($\hat{p}$) of the true population proportion p_{true} is:

$$\hat{p} = \frac{x}{n} \qquad \text{(B2-1)}$$

This value is an estimate, and as a result has some uncertainty associated with it. This uncertainty is quantified by calculating the upper one-sided (1-α) percent confidence limit for p, devined as p_{UCL}. This confidence limit gives the largest value the true proportion could take on and still have a "reasonable" chance (e.g., an α = 0.10 probability) of producing x miscertified containers in a sample of n out of N. This upper confidence limit is calculated as:

$$P_{UCL} = \frac{M_{UCL}}{N} \qquad \text{(B2-2)}$$

where M_{UCL} is the smallest value of M such that the probability of observing x or fewer miscertified containers in a sample of size n is less than or equal to α. That is, it is the smallest value M such that the following inequality is true:

$$\sum_{k=0}^{x} \frac{\binom{M}{k}\binom{N-M}{n-k}}{\binom{N}{n}} \leq \alpha \qquad \text{(B2-3)}$$

where each term in parentheses has the usual combinatorial interpretation. For example:

$$\binom{M}{k} = \frac{M!}{k!(M-k)!} \qquad \text{(B2-4)}$$

For Ee ach term in the sum in Equation B2-3, the upper confidence limit is dependent on x, the number of miscertifications observed in the sample, as well as on n, the sample size. To obtain the required sample size, the values of x that are likely to be seen are considered. The sample size to be visually examined is determined by setting a desired upper confidence limit value and then manipulating x and n in Equation B2-3.

Note that in Equation B2-3, the upper confidence limit is dependent on x, the number of miscertifications observed in the sample, as well as on n, the sample size. To obtain the required sample size, the values of x that are likely to be seen are also considered.

Sample size that shall be visually examined shall be determined by setting a desired upper confidence limit value and then manipulating x and n in Equation B2-3.

B2-2 Approach for Selecting Waste Containers for Statistical Sampling

B2-2a Statistical Selection of Containers for Totals Analysis

The statistical approach for characterizing retrievably stored homogeneous solids and soil/gravel waste using sampling and analysis will rely on using AK to segregate waste containers into relatively homogeneous waste streams. Using AK, the CCP will classify the entire waste stream as hazardous or nonhazardous rather than individual waste containers. Individual waste containers will serve as convenient units for characterizing the combined mass of waste from the waste stream of interest. Once segregated by waste stream, random selection and sampling of the waste containers will be followed by analysis of the waste samples, performed to ensure that the resulting mean contaminant concentration provides an unbiased representation of the true mean contaminant concentration for each waste stream. The CCP SPM will verify that the samples collected from within a waste stream were selected randomly.

An end use of analytical results for retrievably stored homogeneous solids and soil/gravel is for assigning the Hazardous Waste Codes for toxicity characteristics that apply to each waste stream and to confirm AK. The toxicity characteristic Hazardous Waste Codes will indicate that the waste exhibits the toxicity characteristic for specific contaminants under the RCRA. The RCRA-toxicity determination will be made on the basis of sampling and analysis of waste streams and on whether or not the waste stream includes listed wastes. If a waste stream includes one or more Hazardous Waste Codes for listed wastes identified via AK, toxicity characteristic contaminants associated with listed waste(s) will not included in the toxicity characteristic determination. That is, the Hazardous Waste Codes for listed wastes will take precedence over the waste stream that is assumed hazardous regardless of the concentration. Therefore, toxicity characteristics contaminants associated with Hazardous Waste Codes for listed wastes for a waste stream will be omitted from all calculations for determining the number of containers to sample because these wastes streams will be assumed to be hazardous. In addition, each toxicity characteristic contaminant associated with the Hazardous Waste Codes for listed wastes will be excluded from evaluation of analytical results to determine the toxicity characteristics Hazardous Waste Codes. Contaminants of interest for the sampling, analysis, and RCRA-toxicity determination of a waste stream, then, will exclude contaminants associated with Hazardous Waste Codes for listed wastes that have been assigned to the waste stream.

The sampling and analysis strategy will be implemented in accordance with CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*. Preliminary estimates of the mean concentration and variance of each RCRA regulated contaminant in the waste will be used to determine the number of waste containers to select for sampling and analysis. The preliminary estimates will be made by obtaining a preliminary number of

samples from the waste stream or from previous sampling from the waste stream. Preliminary estimates will be based on samples from a minimum of 5 waste containers. Samples collected to establish preliminary estimates that are selected, sampled, and analyzed in accordance with applicable provisions of this QAPjP may be used as part of the required number of samples to be collected. The applicability of the preliminary estimates to the waste stream to be sampled will be justified and documented. The preliminary estimates will be determined in accordance with the following equations:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{(B2-5)}$$

$$s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2 \qquad \text{(B2-6)}$$

where $\bar{x}$ is the calculated mean and s^2 is the calculated concentration variance, n is the number of samples analyzed, x_i is the concentration determined in the *ith* sample, and *i* is an index from 1 to n.

Based upon the preliminary estimates of x and s^2 for each chemical contaminant of concern, the appropriate number of samples (*n)* to be collected for each contaminant will be estimated using the following formulas from SW-846 (EPA 1996):

$$n = \frac{t^2_{a,n_o-1}s^2}{(RT - \bar{x})^2} \qquad \text{(B2-7)}$$

Where:

n_0 = the initial number of samples used to calculate the preliminary sample estimate.
n = the calculated number of samples in the preliminary estimate.
t^2 = the 90th percentile for a *t* distribution with n_0-1 degrees of freedom.
RT = Regulatory Threshold of the contaminant (limit for toxicity characteristic wastes, PRQL for listed wastes)

The number of samples to be collected is based upon the largest *n* calculated for each of the contaminants of concern. The actual number of samples collected will be adjusted as necessary to ensure that an adequate number of samples are collected to allow for acceptable levels of completeness.

All calculations should be rounded up to the nearest integer. A minimum of five containers will be sampled and analyzed in each waste stream. If there are fewer than the minimum or required number of containers in a waste stream, one or more containers will be sampled more than once to obtain the number samples needed. Otherwise the CCP select any one container for sampling only once.

The calculated total number of required waste containers will then be randomly sampled and analyzed. The CCP may count waste container samples from the preliminary mean and variance estimates as part of the total number of calculated required samples if and only if:

- There is documented evidence that the waste containers for the preliminary estimate samples were selected in the same random manner as is chosen for the required samples

- There is documented evidence that the method of sample collection in the preliminary estimate samples were identical to the methodology to be employed for the required samples

- There is documented evidence that the method of sample analysis in the preliminary estimate samples was identical to the analytical methodology employed for the required samples

- There is documented evidence that the validation of the sample analyses, in the preliminary estimate samples, was comparable to the validation employed for the required samples. In addition, the validated sample results indicate that all sample results were valid according to the analytical methodology

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the CCP may assign Hazardous Waste Codes to a waste stream. For waste streams with calculated upper confidence limits below the regulatory threshold, the CCP collects the required number of samples if it intends to establish that the constituent is below the regulatory threshold

B2-2b Statistical Selection of Containers for Headspace Gas Analysis

If a waste stream meets the conditions for representative headspace gas sampling in Section B-3a(1), headspace gas sampling of that waste stream may be done on a randomly selected portion of containers in the waste stream. The CCP determines the

minimum number of containers, *n*, to be sampled by taking an initial VOC sample from 10 randomly selected containers. These samples are analyzed for all the target analytes. The standard deviation, *s*, is calculated for each of the nine VOCs in the HWFP Module IV, Table IV.D.1 (NMED 1999). The value of *n* is determined as the largest number of samples (not to exceed the number of containers in the waste stream or waste stream lot) calculated using the following equation:

$$n_{voc_i} = \left(\frac{t_{0.9,n-1} \times s_{e_{VOC_i}}}{E_{voc_i}} \right)^2 \qquad \text{(B2-8)}$$

where:

n_{voc_i} is the number of samples needed to representatively sample the waste stream for the VOC_i from Table IV.D.1

s_{evoc_i} is the estimated standard deviation, based on the initial 10-samples, for VOC_i from Table IV.D.1

E_{voc_i} is the allowable error determined as 1% of the limiting concentration for VOC_i from Table IV.D.1

The CCP may count waste container samples from the preliminary mean and variance estimates as part of the total number of calculated required samples if and only if:

- There is documented evidence that the waste containers for the preliminary estimate samples were selected in the same random manner as is chosen for the required samples
- There is documented evidence that the method of sample collection in the preliminary estimate samples was identical to the methodology to be employed for the required samples
- There is documented evidence that the method of sample analysis in the preliminary estimate samples, was identical to the analytical methodology employed for the required samples
- There is documented evidence that the validation of the sample analyses, in the preliminary estimate samples, was comparable to the validation employed for the required samples. In addition, the validated sample results indicate that all sample results were valid according to the analytical methodology

The mean and standard deviation calculated after sampling *n* containers are used to calculate a UCL_{90} for each of the headspace gas VOCs using the methodology presented in Section B2-3b.

B2-3 Upper Confidence Limits for Statistical Sampling

B2-3a Upper Confidence Limit for Statistical Solid Sampling

Upon completion of the required sampling, final mean and variance estimates and the UCL_{90} for the mean concentration for each contaminant is determined. The observed sample *n** is checked against the preliminary estimate for the number of samples (n) to be collected before proceeding, where n* is:

$$n^* = \frac{t^2_{a,n-1} s^2}{\left(RT - \bar{x}\right)^2} \qquad \text{(B2-9)}$$

If the observed sample *n** estimate results in greater than 20 percent more required samples than were originally calculated, then the additional samples required to fulfill the revised sample estimate are collected and analyzed. The determination of *n** is an iterative process that continues until the difference between *n** and the previous sample determination is less than 20 percent.

Once sufficient sampling and analysis has occurred, the waste characterization proceeds. The assessment is made with 90 percent confidence. The UCL_{90} for the mean concentration of each contaminant is calculated in accordance with the following equation:

$$UCL_{90} = \bar{x} + \frac{t_{a,n-1} s}{\sqrt{n}} \qquad \text{(B2-10)}$$

When composite headspace gas sample results are used, the mean, standard deviation and t-statistic are based on the number of samples analyzed, rather than the number of drums sampled. If the UCL_{90} for the mean concentration is less than the regulatory threshold limit, the waste stream is not assigned the Hazardous Waste Code for this contaminant. If the UCL_{90} is greater than or equal to the regulatory threshold limit, the Hazardous Waste Code for this contaminant is assigned to the waste stream.

B2-3b Upper Confidence Limit for Statistical Headspace Gas Sampling

If a waste stream meets the conditions for representative headspace gas sampling in Section B-3a(i), a UCL_{90} concentration for each of the headspace gas VOCs is calculated from the sample data collected. The observed sample *n** is checked against the estimate for the number of samples (n) to be collected before proceeding, where n* is:

$$n^* = \frac{t^2_{a,n-1}\, s^2}{E^2} \qquad \text{(B2-11)}$$

If the observed sample *n** estimate results in greater than 20 percent more required samples than were originally calculated, then the additional samples required to fulfill the revised sample estimate are collected and analyzed. The determination of *n** is an iterative process that continues until the difference between *n** and the previous sample determination is less than 20 percent. (If 100 percent of headspace gas sampling is done, formula B2-11 is not applicable.) Then, the UCL_{90} is calculated using equation B2-10. In this case, UCL_{90} is the 90 percent upper confidence VOC concentration, θ is the calculated mean VOC concentration, and *s* is the standard deviation. The value of $t_{(\%,\, n-1)}$ is taken from Table 9-2 of Chapter 9 of SW-846. The calculated UCL_{90} concentration for each headspace gas VOC is then assigned to those containers in the waste stream not selected for headspace gas sampling. If the calculated UCL_{90} concentration is less than the applicable MDL, the MDL for the VOC is assigned to each unsampled container instead of the UCL_{90} concentration.

Compliance with the requirements for calculation and comparison of the UCL_{90} to regulatory thresholds is achieved through the execution of CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*. Upon completion of the required sampling, the actual mean and variance and the UCL_{90} for the mean concentration for each contaminant are calculated as described in CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*.

B2-4 Control Charting for Newly Generated Waste Stream Sampling

The CCP determines significant process changes and process fluctuations associated with newly generated waste using statistical process control (SPC) charting techniques; these techniques use historical data for determining limits for indicator species, and subsequent periodic sampling to assess process behavior relative to historical limits. The CCP uses the SPC charting techniques on waste prior to solidification or packaging for ease of sampling. If the limits are exceeded for any toxicity characteristic parameter, the waste stream is recharacterized according to this QAPjP.

A Shewhart control chart (Gilbert, 1987) is a control chart for means that can be used for checking whether current data are consistent with past data and whether shifts or trends in means have occurred. The control chart for means is constructed of a center line and upper and lower control limits that are based on the mean and standard deviation of historical data for the process. If a current sample mean from the process lies within the limits, the process is said to be "in control," or consistent with historical data. If the current mean exceeds the limits, the process has likely changed from historical periods.

The CCP uses logical sets of historical data to construct the limits. If available, the data from the initial characterization of the waste stream are used. If the initial characterization data are not available data from characterization of a different lot of the waste stream or from a retrievably stored waste stream of the same type from the same process are used. At a minimum, the logical set includes ten representative sample values collected and analyzed from the newly generated waste stream. The CCP justifies the data used for construction of the limits. The underlying assumption for control charts are that the data are independent and normally distributed with constant mean ： and constant variance s^2. The statistical tests for normality are conducted and data transformation to normality performed, if necessary. Transformations take place prior to any calculations that use the data.

Each limit is constructed such that there is a 90 percent confidence that the true mean does not exceed a limit. One-sided control limits are used because once a waste stream has been determined to be RCRA-hazardous, the limit exceedance of interest is on the lower side; that is when the process may become nonhazardous. Likewise, once a waste stream has been determined not to be RCRA-hazardous, the limit exceedance of interest is on the upper side; that is when the process may become RCRA-hazardous. Whether or not exceeding the limit would result in a change in the RCRA-hazardous nature of the waste stream depends on how close the observed control limits are to RCRA limits.

The CCP collects and averages process data for comparison to the control limit for the mean. The collection period and number of samples to be included in the average depend on the waste stream characteristics. A small number of samples will reflect more of the process variability and there will potentially be more limit exceedance. If two or three samples are collected for the mean in the required annual (or batch) sampling of a relatively homogeneous waste stream, limit exceedances may not occur. If the waste stream is less homogeneous, the CCP collects, *CCP Sampling Design and Data Analysis for RCRA Characterization* more samples to meet the required confidence limit.

Periodically, the CCP updates the control limit for a process. The update includes all historical data if there is no evidence of a trend in the process or a shift in the mean for the process. If there has been a shift in the mean, only more recent data that reflects the shift is used. Control limits are based on at least ten data points that are representative of the process and do not exhibit outliers or a trend with time.

Table B2-1 Number of Waste Containers Requiring Visual Examination

Annual Number of Waste Containers per Summary Category Group Undergoing Characterization	Number of Waste Containers Requiring Visual Examination Based on Percent of Waste Containers Miscertified to WIPP WAC by Radiography in Previous Year(s)													
	1% or less	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14% or greater
50 or less	22[a]	22	22[a]	22	29[a]	29	41[a]	41	46[a]	46	50[a]	50	50[a]	50
100	15	24	24	33	33	41	48	62	69	81	87	96	100	100
200	15	26	26	35	44	52	68	83	105	126	152	176	196	200
300	15	26	26	35	44	53	70	94	116	153	202	247	287	300
400	15	26	26	36	45	62	79	103	134	178	235	316	377	400
500	16	26	26	36	45	63	80	104	143	196	268	364	465	500
1000	16	27	27	36	46	64	81	114	162	239	359	568	848	1000
1500	16	27	27	37	46	64	81	123	171	257	416	701	1176	1500
2000	16	27	27	37	46	64	90	123	172	266	441	795	1453	2000

[a] Number of containers for the higher even-number percent of miscertified containers is used because an odd percent implies a noninteger number of containers are likely to be miscertified.

B3 QUALITY ASSURANCE OBJECTIVES AND DATA VALIDATION TECHNIQUES FOR WASTE CHARACTERIZATION SAMPLING AND ANALYTICAL METHODS

B3-1 Validation Methods

The CCP performs validation of qualitative and quantitative data so that characterization data are of known and acceptable quality. Validation methods quantitatively assess precision, accuracy, method detection limits (MDLs) (as appropriate), and completeness for analytical data (headspace gas VOCs, and total VOCs, SVOCs, and metals). Quantitative data validation is performed according to the methods outlined in this section. Data are assessed for compliance with the QAOs in Sections B3-2 through B3-9.

Comparability and representativeness parameters are assessed qualitatively. The qualitative data or descriptive information generated by radiography and VE are not amenable to statistical data quality analysis. However, as described in Section B1-3, radiography and VE are complementary techniques yielding similar data for determining the waste matrix code and waste material parameter weights (Table B3-1 provides the waste material parameters) of waste present in a waste container. Therefore, VE results are used to verify the waste matrix code determined via radiography and waste material parameter weights. The waste matrix code is determined and waste material parameter weights, are estimated to verify that the container is properly included in the appropriate waste stream.

Data validation is used to assess the quality of waste characterization data collected based on project precision, accuracy, completeness, comparability, and representativeness objectives. These objectives are described below:

Precision

Precision is a measure of the mutual agreement among multiple measurements of a single analyte, either by the same or different methods. Precision is either expressed as the relative percent difference (RPD) for duplicate measurements or as the percent relative standard deviation (%RSD) for three or more replicate measurements.

For duplicate measurements, the precision expressed as the RPD is calculated as follows:

$$RPD = \frac{C_1 - C_2}{\left(\frac{C_1 + C_2}{2}\right)} \times 100 \quad \text{(B3-1)}$$

where C_1 and C_2 are the two values obtained by analyzing duplicate samples. C_1 is the larger of the two observed values.

For three or more replicate measurements, the precision expressed as the %RSD is calculated as follows:

$$\%RSD = \frac{s}{y_{mean}} \times 100 \quad \text{(B3-2)}$$

where s is the standard deviation and y_{mean} is the mean of the replicate sample analysis.

The standard deviation, s, is calculated as follows:

$$s = \sqrt{\frac{\sum_{i=1}^{n} (y_i - y_{mean})^2}{n-1}} \quad \text{(B3-3)}$$

where y_i is the measured value of the i^{th} replicate sample analysis measurement and n is the number of replicate analysis.

Another aspect of precision is associated with analytical equipment calibration. In these instances, the percent difference (%D) between multiple measurements of an equipment calibration standard is calculated as follows:

$$\%D = \frac{|C_1 - C_2|}{C_1} \times 100 \quad \text{(B3-4)}$$

where C_1 is the initial measurement and C_2 is the second or other additional measurement.

Accuracy

Accuracy is the degree of agreement between a measured analyte concentration (or the average of replicate measurements of a single analyte concentration) and the true or known concentration. Accuracy is determined as the percent recovery (%R).
For situations in which a standard reference material is used, %R is calculated as follows:

$$\% R = \frac{C_m}{C_{srm}} \times 100 \qquad \text{(B3-5)}$$

where C_m is the measured concentration value obtained by analyzing the sample and C_{srm} is the "true" or certified concentration of the analyte in the sample.

For measurements where matrix spikes are used, the %R is calculated as follows:

$$\% R = \frac{S - U}{C_{sc}} \times 100 \qquad \text{(B3-6)}$$

where S is the measured concentration in the spiked aliquot, U is the measured concentration in the unspiked aliquot, and C_{SC} is the actual concentration of the spike added.

Method Detection Limit

The MDL is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The MDL for quantitative measurements is defined as follows:

$$MDL = t_{(n-1,1-\alpha=.99)} \times s \qquad \text{(B3-7)}$$

where $t_{(n-1,\ 1-\alpha=.99)}$ is the t-distribution value corresponding to a 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom, n is the number of observations, and s is the standard deviation of replicate measurements.

(Formula B3-8 is not used at this time.)

Completeness

Completeness is a measure of the amount of valid data obtained from the overall measurement system compared to the amount of data collected and submitted for analysis. Completeness is expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Completeness, expressed as the percent complete (%C) is calculated as follows:

$$\%\,C = \frac{V}{n} \times 100 \qquad \text{(B3-9)}$$

where V is the number of valid sampling or analytical results obtained and n is the number of samples submitted for analysis.

Comparability

Comparability is the degree to which one data set can be compared to another. Comparability of data generated at different sites is assured through the use of standardized, approved testing, sampling, preservation, and analytical techniques and equipment and by meeting the QAOs specified in Sections B3-2 through B3-9.

The comparability of waste characterization data is ensured by using EPA data usability criteria (EPA 1994b and 1994c).
The criteria include the following information:

- Definition or reference of criteria used to define and assign data qualifier flags based on QAO results;
- Criteria for assessing the usability of data impacted by matrix interferences;
- Criteria for assessing usability of data based on positive and negative bias indicated by QC data, and data qualifier flags;
- Criteria for assessing the usability of data due to severe matrix effects, misidentification of compounds, gross exceedance of holding times, and failure to meet calibration or tuning criteria;
- Criteria for assessing usability of data that do not meet MDL requirements.

Representativeness

Representativeness is the degree to which sample data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that concerns the proper design of the sampling program.

Representativeness of waste containers from waste streams subjected to VE and homogeneous solids and soil/gravel sampling and analysis is validated through documentation that a true random sample from an adequate population was collected. Since representativeness is a qualitative characteristic that expresses the degree to which a sample represents the population being studied, the random selection of waste containers ensures representativeness on a Program level. Using CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization* as described in Section B2, the CCP SPM documents that the selected waste containers from within a waste stream were randomly selected. Sampling personnel verify that proper procedures are followed to ensure that samples are representative of the waste contained in a particular waste container or waste stream.

Nonconformance to Data Quality Objectives

If data are generated that do not meet DQOs, the issue is treated as a nonconformance as discussed in Section B3-13. The SPM notifies the Permittee in writing within five calendar days of the identification of any non-administrative nonconformance related to the WAP requirements that are identified at the CCP SPM signature release level. A complete NCR is submitted to the Permittee within thirty calendar days of identification of the incident. The CCP implements a corrective action to remedy the nonconformance prior to shipment of the waste to WIPP. For analytical data, if a DQO is not met due to matrix effects, the data are not considered a nonconformance. Such data are flagged appropriately and discussed in the case narrative of the associated batch data report.

Identification of Tentatively Identified Compounds

In accordance with the convention of SW-846 (EPA 1997), identification of compounds detected by GC/MS that are not on the Table B-3 target analyte list are reported. CCP headspace gas, VOC (total/TCLP), and SVOC (total/TCLP) analyses are subject to TIC reporting. The process for adding TICs to the target analyte list is described in CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*.

TICs for GC/MS methods are identified in accordance with the following SW-846 criteria (EPA 1997):

- Relative intensities of major ions in the reference spectrum (ions greater than 10 percent of the most abundant ion) should be present in the sample spectrum
- The relative intensities of the major ions should agree within ± 20 percent
- Molecular ions present in the reference spectrum should be present in the sample spectrum
- Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds
- Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks

TICs meeting the SW-846 criteria, detected in 25 percent of the samples from a given waste stream, and listed in 20.4.1.200 NMAC (incorporating 40 CFR 261) Appendix VIII, are compared with AK data as described in CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data* and CCP-TP-005, *CCP Acceptable Knowledge Documentation*, to determine if the TIC is a listed constituent in the waste stream. TICs identified through headspace gas analyses that are on the Appendix VIII list and meet the 25 percent identification criteria for a waste stream are added to the headspace gas waste stream target analyte list, regardless of the Hazardous Waste Codes associated with the waste stream.

TICs reported from the totals VOC or SVOC analyses are excluded from the target analyte list for a waste stream if the TIC is a constituent in an F-listed waste whose presence is attributable to waste packaging materials or radiolytic degradation described in AK documentation. If a listed waste constituent TIC cannot be attributed to waste packaging materials, radiolysis, or other origins, the constituent is added to the target analyte list and new Hazardous Waste Codes are assigned, if appropriate. TICs subject to inclusion on the target analyte list that are also toxicity characteristic parameters are added to the target analyte list regardless of origin because the hazardous waste designation for these numbers is not based on source. However, toxicity characteristic parameter and nontoxic F003 constituent concentration is taken into account when assessing whether to add a Hazardous Waste Code. If a target analyte list for a waste stream is expanded due to the presence of TICs, all subsequent samples collected from that waste stream are analyzed for constituents on the expanded list.

B3-2 Headspace Gas Sampling

Quality Assurance Objectives

Headspace gas sampling from within the headspace of each container of TRU waste or randomly selected containers from waste streams that meet the conditions for reduced headspace gas sampling listed in Section B-3a(1) is performed using an on-line integrated sampling and analysis system (or the direct canister if needed in the future). This activity is performed in accordance with this QAPjP and as described in CCP-TP-007, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Operating Procedure*, CCP-TP-029, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration* and CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold*. Currently, samples are not collected and transferred to a laboratory for analysis but obtained and analyzed on-line using an integrated system requiring no sample transfer. The CCP prepares, submits, and resolves a nonconformance report when QAOs are not met.

The precision and accuracy of the drum headspace-gas sampling operations are assessed by analyzing field QC headspace-gas samples. These samples include equipment blanks, field reference standards, field blanks, and field duplicates. If the QAOs described below are not met, a nonconformance report is prepared, submitted, and resolved (Section B3-13).

Precision

The precision of the headspace-gas sampling and analysis operation is assessed by sequential collection of field duplicates for manifold sampling operations or simultaneous collection of field duplicates for direct canister sampling operations for VOCs determination. Corrective actions are taken if the RPD exceeds 25 percent for any analyte found greater than the PRQL in both of the duplicate samples.

Accuracy

A field reference standard is collected using headspace-gas sampling equipment to assess the accuracy of the headspace-gas sampling operation at a frequency of one field reference standard for every 20 drums sampled or per sampling batch. Corrective action is taken if the %R of the field-reference standard is less than 70 or greater than 130.

Field blanks are also collected at a frequency of 1 field blank for every 20 drums or sampling batch sampled to assess possible contamination in the headspace gas sampling method. Equipment blanks are also collected at a frequency of 1 equipment blank for each equipment cleaning batch to assess possible contamination in the equipment cleaning method. Corrective actions are taken if the blank exceeds three times the MDLs listed for any of the compounds listed in Table B3-2.

Completeness

Sampling completeness is expressed as the number of valid samples collected as a percent of the total number of samples collected for each waste stream. The completeness is also expressed as the number of valid samples collected as a percent of the total number of drums for each waste stream. A valid sample is defined as a sample collected in accordance with approved sampling methods and the drum was properly prepared for sampling (e.g., the polyliner was vented to the drum headspace). The CCP achieves a minimum 90 percent completeness. The amount and type of data that may be lost during the headspace-gas sampling operation cannot be predicted in advance. The CCP SPQAO evaluates the importance of any lost or contaminated headspace-gas samples and take corrective action as appropriate.

Comparability

Consistent use and application of uniform procedures and equipment, as specified in Section B1 and application of data usability criteria (EPA 1994b and 1994c), ensures that headspace gas sampling operations are comparable when sampling headspace at the different sampling facilities. The CCP will takes corrective actions if uniform procedures, equipment, or operations are not followed without approved and justified deviations. In addition, CCP laboratories analyzing samples participate in the Performance Demonstration Program.

Representativeness

Specific headspace-gas sampling steps to ensure samples are representative include:

- A sample canister cleaning and leak check after assembly
- Sampling equipment cleaning or disposal after use
- Sampling equipment leak check after sample collection
- Use of sample canisters with passivated internal surfaces
- Use of low-internal-volume sampling equipment
- Collection of samples with a low-sample volume to available headspace volume ratio (less than 10 percent of the headspace when the headspace can be determined)
- Careful and documented pressure regulation of all activities specified in Section B1-1

- Performance audits
- Collection of equipment blanks, field reference standard, field blanks, and field duplicates at the specified frequencies
- Manifold pressure sensors and temperature sensors calibrated before initial use and annually using NIST, or equivalent standards
- OVA calibrated daily, prior to first use, or as necessary according to manufacturers specifications

Failure to perform the checks at the prescribed frequencies would result in corrective actions.

B3-3 Sampling of Homogeneous Solids and Soils/Gravel

Quality Assurance Objectives

For waste containers of homogeneous solids and soil/gravel, the CCP will collect samples randomly in both the horizontal and vertical planes of each container to ensure that sampling is conducted in a representative manner on a waste stream basis. For waste containers that contain homogeneous solids and soil/gravel in smaller containers (e.g., 1 gal [4.0 L] poly bottles) within the waste container, the CCP will randomly select and sample one smaller container from each drum.

Precision

The CCP will determine sampling precision by collecting and sampling field duplicates (e.g., co-located cores or co-located samples) once per sampling batch or once per week during sampling operations, whichever is more frequent. A sampling batch is a suite of 20 samples (excluding field QC samples) of homogeneous solids or soil/gravel that is consecutively collected within 14 days of the first sample using the same sampling equipment. The CCP SPQAO will calculate and report the RPD between co-located core/samples.

The CCP will use the recommended method (F-test) for establishing acceptance criteria for co-located cores and co-located samples. After 25 to 30 pairs of co-located cores or samples are collected, control charts of the RPD will be developed for each constituent and for each waste matrix or waste type (e.g., pyrochemical salts or organic sludges). The limits for the control chart will be three standard deviations above or below the average RPD. Once constructed, RPDs for additional co-located pairs will be compared with the control charts to determine whether or not the co-located cores are acceptable.

Periodically, the CCP will update the control charts using all available data (CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*).

The CCP will calculate the variance for co-located cores and samples by pooling the variances computed for each pair of duplicate results. To achieve independence, the variance for the waste stream will be computed excluding any data from drums with co-located cores. All data will be transformed to normality prior to computing variances and performing the test. The test hypothesis will be evaluated using the F distribution and the method for testing the difference in variances.

Accuracy

The CCP does not determine sampling accuracy through the use of standard reference materials. Because waste containers containing homogeneous solids and soil/gravel with known quantities of analytes are not available, sampling accuracy cannot be determined. However, the CCP will use the sampling methods and requirements described in order to minimize sample degradation and maximize sampling accuracy.

Sampling accuracy as a function of sampling cross-contamination will be measured. Equipment blanks will be collected at a frequency of once per equipment cleaning batch. Corrective actions will be taken if the blank exceeds three times the MDLs (PRDLs for metals) listed for any of the compounds or analytes listed in Tables B3-4, B3-6, and B3-8. Equipment blanks will be collected from the following equipment types:

- Fully assembled coring tools
- Liners cleaned separately from coring tools
- Miscellaneous sampling equipment that is reused (bowls, spoons, chisels)

Completeness

The CCP will ensure sampling completeness by expressing the number of valid samples collected as a percent of the total number of samples collected for each waste stream. A valid sample is any sample that is collected from a randomly selected drum using randomly selected horizontal and vertical planes in accordance with the approved sampling methods. The sampling facility will achieve a minimum 90 percent completeness.

Comparability

The CCP consistently uses uniform procedures, sampling equipment, and measurement units, and applies data usability criteria (EPA 1994b and 1994c) to ensure that sampling operations are comparable. The CCP participates in the PDP.

Representativeness

The CCP will ensure the representativeness of samples for both waste containers and smaller containers through the following steps:

- Coring tools and sampling equipment will be cleaned prior to sampling

- The entire depth of the waste, minus a CCP-defined approved safety factor will be cored, and the core collected will have a length greater than or equal to 50 percent of the depth of the waste. The CCP will calculate this core recovery as follows:

(B3-10)

$$\text{Core recovery (percent)} = \frac{y}{x} \times 100$$

where:

x = the depth of the waste in the container
y = the length of the core collected from the waste.

- Coring operations and tool selection should be designed to minimize alteration of the in-place waste characteristics. The CCP will verify that minimal waste disturbance occurs by visually examining the core and describing the observation (e.g., undisturbed, cracked, or pulverized) in the field logbook

  If core recovery is less than 50 percent of the depth of the waste, a second coring location will be randomly selected and the core with the best core recovery will be used for sample collection.

- One randomly selected container within a drum will be chosen if the drum contains individual waste containers

B3-4 Radiography

Radiography is performed by approved, qualified personnel according to CCP-TP-011, *CCP Radiography Inspection Operating Procedure* or CCP-TP-012, *CCP Digital Radiography/Computed Tomography*. The QAOs for radiography are described in this section. To ensure acceptable data quality and comparability, radiography personnel meet the detailed training requirements specified in Section B1-3 before they characterize TRU waste containers.

Quality Assurance Objectives

If the QAOs in this section are not met, the NCR process is initiated. Radiography does not have a specific MDL because it is primarily a qualitative determination. The objective of radiography is to verify the waste matrix code, identify prohibited items for each waste container, and to estimate material parameter weights. Data to meet the QAOs for radiography are obtained from an audio/videotaped (or equivalent media) scan provided by trained radiography operators at the host site. Results are also recorded on a radiography data form. The precision, accuracy, completeness, and comparability objectives for radiography data follow.

Precision

Qualitative determinations made under radiography, such as verifying the waste matrix code, do not lend themselves to statistical evaluation of precision because of the qualitative nature of the inspection. However, comparison of radiography and VE data from various TRU waste generators indicates that radiography operators can provide estimated inventories and weights of waste items in a waste container. Precision is quantitatively assessed by the SPQAO who calculates and reports the RPD between waste material parameter weights as determined by radiography and these same parameters as determined by VE according to CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*. The precision of radiography is also verified prior to use by tuning precisely enough to demonstrate compliance with QAOs listed in Section B-4a through viewing an image test pattern.

Accuracy

The accuracy of CCP radiography activities in determining the waste matrix code and waste material parameter weights is assessed and documented by VE of a randomly-selected statistical portion of waste containers characterized by radiography. This process is described in CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*. The SPQAO calculates and reports the miscertification rate of waste containers that require assignment to a different waste matrix code or are found to contain prohibited items after VE as a measure of radiography accuracy. The calculated rate, called the miscertification rate, is used to determine the number of drums subject to confirmatory VE.

Completeness

To ensure completeness, an audio/videotape (or equivalent media) of the radiography examination and a validated radiography data form are obtained for 100 percent of retrievably stored waste containers that are examined by radiography.
All audio/videotapes (or equivalent media) and radiography data forms are subject to validation as indicated in Section B3-10.

Comparability

The comparability of radiography data are enhanced by using standardized radiography procedures and operator qualifications.

B3-5 Gas Volatile Organic Compound Analysis

The CCP performs headspace gas sampling and analysis using on-line integrated sampling and analysis systems described in Section B1-1 and CCP-TP-007, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Operating Procedure*, CCP-TP-029, *CCP Single-Sample Manifold Headspace Gas Sampling and Analysis Methods and Equipment Calibration* and CCP-TP-031, *CCP Headspace Gas Sampling Using an Automated Manifold*. The CCP participates in the headspace gas DOE-CBFO PDP. Requirements pertinent to sampling and analysis methods, data management, equipment testing, inspection, maintenance, and calibration are described in activity-specific procedures. The key data quality indicators for headspace gas sampling and analysis are defined below.

Precision

The CCP assesses precision by analyzing laboratory duplicates and replicate analyses of laboratory-control samples (sequential collection of on-line duplicates during sampling operations and by analyzing on-line duplicates), and PDP blind audit samples. Results are compared to the criteria listed in Table B3-2. The QC measurements are used to demonstrate acceptable representative sampling and analytical method performance. The CCP takes corrective action if the QAOs are not met.

Accuracy

The CCP assesses accuracy as %R by collecting on-line laboratory control samples at a frequency of one every on-line batch and by analyzing on-line control samples and PDP blind audit samples. Results are compared to the QAO's listed in Table B3-2. If the QAOs are not met, the CCP initiates corrective actions.

Calibration

GC/MS tunes, initial calibration, and continuing calibration are performed by the CCP and evaluated using the procedures and criteria specified in Table B3-3. Acceptable performance is demonstrated before sample analysis begins. Corrective action is taken if the control limits are exceeded.

Method Detection Limit

The CCP determines MDLs in accordance with the headspace gas procedures, which comply with the method described in Section B3-1. MDLs are expressed in nanograms (ng) and are less than or equal to those listed in Table B3-2. The CCP does not initiate field sample analysis until MDLs meeting the requirements listed in Table B3-2 are obtained. MDL determinations are defined in the headspace gas procedures.

Program Required Quantitation Limits

The CCP demonstrates the capability to quantify analytes at or below the PRQL listed in Table B3-2 by setting the concentration of at least one calibration standard below the PRQL as found in the headspace gas procedures.

Completeness

The CCP determines laboratory completeness as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. A composited sample is treated as one sample for the purposes of completeness because only one sample is run through the analytical instrument. Valid results are defined as those that meet the data usability criteria (EPA 1994b and 1994c), meet the MDL, calibration, representativeness, and comparability criteria described in this section.

The CCP meets the criterion of 90 percent for completeness. The SPQAO evaluates the importance of any lost or contaminated headspace gas data and takes corrective actions, as appropriate.

Comparability

The CCP uses consistent and uniform sampling procedures and equipment, participates in the headspace gas DOE-CBFO PDP, implements standardized analytical procedures, and procures and uses traceable standards as described in procedures. CCP applies consistent data usability criteria (EPA 1994b and 1994c). This ensures that headspace gas sampling and analysis operations are comparable when performing these activities at different facilities. The CCP takes corrective action if uniform procedures, equipment, or operations are not used or followed without prior approval and justified deviations.

Representativeness

The CCP conducts sampling and analysis operations to ensure samples are representative of the waste stream. Representativeness is achieved when sufficient numbers of samples are collected using clean sampling equipment that does not introduce sample bias.

B3-6 Total Volatile Organic Compound Analysis

Quality Assurance Objectives

The QAOs for total VOC analysis are listed in Table B3-4. These QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. WAP-required limits, such as the PRQL associated with VOC analysis, will be specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of quality control samples and associated acceptance criteria for this analysis are included in Table B3-5. The key data-quality indicators for laboratory measurements are defined below.

Precision

The CCP will assess precision by analyzing laboratory duplicates or matrix spike duplicates, replicate analyses of laboratory control samples, and PDP blind-audit samples. Results from measurements on these samples will be compared to the criteria listed in Table B3-4. These QC measurements demonstrate acceptable method performance and trigger corrective action if control limits are exceeded.

Accuracy

The CCP will analyze laboratory control samples, matrix spikes, surrogate compounds, and PDP blind-audit samples will be used to assess accuracy as %R for the laboratory operations. Results from these measurements for matrix spike samples will be compared to the %R criteria listed in Table B3-4. Results for surrogates and internal standards will be evaluated as specified in the SW-846 method (EPA 1996) or Table B3-5. These QC measurements demonstrate acceptable method performance and trigger corrective action when control limits are exceeded.

Laboratory blanks will be assessed and evaluated as specified in Table B3-5 to determine possible laboratory contamination. The QC measurements will demonstrate acceptable levels of laboratory contamination and trigger corrective action if control limits are exceeded.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations will be performed and evaluated using the procedures and criteria specified in Table B3-5 and the SW-846 method (EPA 1996). These criteria demonstrate acceptable calibration and trigger correction action if control limits are exceeded.

Method Detection Limit

MDLs will be expressed in milligrams per kilogram (mg/kg) for total VOCs and will be less than or equal to those listed in Table B3-4. The detailed procedures for MDL determination are included in the CCP total VOC analysis procedures.

Program Required Quantitation Limit

The CCP will quantitate analytes in samples at or below the PRQLs given in Table B3-4. The concentration of at least one calibration standard will be set below the PRQL. The process for PRQL demonstration will be incorporated in the CCP total VOC analysis procedures.

Completeness

The CCP will express laboratory completeness as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results will be defined as results that meet the data usability criteria (EPA 1994b and 1994c), the QC criteria specified in Tables B3-4 and B3-5, and meet the calibration, detection limit, representativeness, and comparability criteria within this section. The CCP is required to meet the completeness criteria specified in Table B3-4.

Comparability

The CCP will achieve comparability by using standardized SW-846 sample preparation and methods (EPA 1996) that meet the QAO requirements in Tables B3-4 and B3-5, using traceable standards, and successfully participating in the DOE-CBFO PDP. The CCP will use the most recent version of SW-846 (EPA 1996). Any changes to SW-846 methodology that result in the elimination of sample preparation or analytical methods in use by the CCP will result in a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

The CCP will accomplish representativeness for total VOC analysis by collecting unbiased samples in accordance with Section B1.

B3-7 Total Semivolatile Organic Compound Analysis

Quality Assurance Objectives

The QAOs for total SVOC analyses are listed in Table B3-6. These QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. WAP-required limits, such as the PRQLs, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of quality control samples and associated acceptance criteria for this analysis are included in Table B3-7. Key data-quality indicators for CCP laboratory measurements are defined below.

Precision

The CCP will assess precision by analyzing laboratory duplicates or matrix spike duplicates, replicate analyses of laboratory control samples, and PDP blind-audit samples. Results from measurements on these samples will be compared to the criteria listed in Table B3-6. The QC measurements will demonstrate acceptable method performance and corrective action will be initiated if control limits are exceeded.

Accuracy

The CCP will analyze laboratory control samples, matrix spikes, surrogate compounds, and PDP blind-audit samples will be used to assess accuracy as %R for the laboratory operations. Results from these measurements for matrix spikes samples will be compared to the %R criteria listed in Table B3-6. Results for surrogates and internal standards will be evaluated as specified in the SW-846 method (EPA 1996) or Table B3-7. The QC measurements will demonstrate acceptable method performance and corrective action will be initiated if control limits are exceeded.

Laboratory blanks shall be assessed to determine possible laboratory contamination and are evaluated as specified in Table B3-7. The CCP will use these QC measurements to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations will be performed and evaluated using the procedures and criteria specified in Table B3-7 and the SW-846 method (EPA 1996). The QC criteria will be used to demonstrate acceptable calibration and corrective action is initiated if control limits are exceeded.

Method Detection Limit

MDLs will be expressed in mg/kg for total SVOCs and will be less than or equal to those listed in Table B3-6. The detailed procedures for MDL determination will be included in the CCP SOPs.

Program Required Quantitation Limit

The CCP will quantitate analytes in samples at or below the PRQLs given in Table B3-6. The concentration of at least one calibration standard will be set below the PRQL. The process for PRQL demonstration will be included in laboratory SOPs.

Completeness

The CCP will express laboratory completeness as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results will be defined as results that meet the data usability criteria (EPA 1994b and 1994c), the QC criteria specified in Tables B3-6 and B3-7, and meet the calibration, detection limit, representativeness, and comparability criteria within this Section. The CCP will be required to meet the level of completeness specified in Table B3-6.

Comparability

The CCP will achieve comparability by using standardized SW-846 sample preparation and methods (EPA 1996) that meet the QAO requirements in Tables B3-6 and B3-7, using traceable standards, and successfully participating in the DOE-CBFO PDP. The CCP will use the most recent version of SW-846 if the methods are consistent with QAO requirements. Any changes to SW-846 methodology that result in the elimination of sample preparation or analytical methods in use by the CCP will result in a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

Representativeness for total SVOC analysis will be accomplished by collecting unbiased samples as described in Section B1.

B3-8 Total Metal Analysis

Quality Assurance Objectives

The QAOs for total metals analysis are listed in Table B3-8. The QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. WAP-required limits, such as the PRQLs associated with total metals analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data

users. A summary of QC samples and the associated acceptance criteria for this analysis are included in Table B3-9. Key data-quality indicators for CCP laboratory measurements are defined below.

Precision

The CCP will assess precision by analyzing laboratory duplicates or laboratory matrix spike duplicates, replicate analyses of laboratory-control samples, and PDP blind-audit samples. Results from measurements on these samples will be compared to the criteria listed in Table B3-8. The QC measurements will demonstrate acceptable method performance and corrective action will be initiated if control limits are exceeded.

Accuracy

The CCP will analyze laboratory matrix spikes, PDP blind-audit samples, serial dilutions, interference check samples, and laboratory control samples to assess accuracy. Results from these measurements will be compared to the criteria listed in Tables B3-8 and B3-9. The QC measurements will demonstrate acceptable method performance and corrective action will be initiated if control limits are exceeded.

Laboratory blanks and calibration blanks will be assessed and evaluated as specified in Table B3-9 to determine possible laboratory contamination. The QC measurements will demonstrate acceptable levels of laboratory contamination and corrective action will be initiated if control limits are exceeded.

Calibration

Mass Tunes (for Instrument Calibration Procedure (ICP) MS only), standards calibration, initial calibration verifications, and continuing calibrations will be performed and evaluated using the procedures and criteria specified in Table B3-9 and the SW-846 method (EPA 1996). The criteria will demonstrate acceptable calibration and corrective action will be initiated if control limits are exceeded.

Program Required Detection Limits

PRDLs, expressed in units of micrograms per liter (µg/L), will be the maximum values for instrument detection limits (IDL) permissible for program support under the WAP. IDLs will be less than or equal to the PRDL for the method used to quantitate a specific analyte. Any method listed in Table B-5 may be used if the IDL meets this criteria. For high concentration samples, an exception to the above requirements may be made in cases where the sample concentration exceeds five times the IDL of the instrument being used. In this case, the CCP may report the analyte concentration even though the IDL may exceed the PRDL. IDLs will be determined semiannually (i.e., every six months). Details for IDL determination will be included in the CCP total metals procedures.

Program Required Quantitation Limit

The CCP will quantitate analytes in samples at or below the PRQLs in units of mg/kg wet weight given in Table B3-8. The PRDLs will be set an order of magnitude less than the PRQLs (assuming 100 percent solid sample diluted by a factor of 100 during preparation). The concentration of at least one QC or calibration standard will be set at or below the solution concentration equivalent of the PRQL. Details for calibration will be found in the CCP total metals analysis procedures.

Completeness

The CCP will express laboratory completeness as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results will be defined as results that meet the data usability criteria (EPA 1994b and 1994c) the QC criteria specified in Tables B3-8 and B3-9, and meet the detection limit, calibration, representativeness, and comparability criteria within this Section. The CCP will be required to meet the level of completeness specified in Table B3-8.

Comparability

The CCP will achieve comparability by using standardized SW-846 sample preparation and methods (EPA 1999) that meet the QAO requirements in Tables B3-8 and B3-9, using traceable standards, and by successfully participating in the DOE-CBFO PDP. The CCP may use the most recent version of SW-846 if the methods are consistent with QAO requirements. Any changes to SW-846 methodology that result in the elimination of sample preparation or analytical methods used by the CCP will result in a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

The CCP will accomplish representativeness for total metals analysis by collecting unbiased samples as described in Section B1 and preparing the samples in the laboratory using representative and unbiased methods.

B3-9 Acceptable Knowledge

Quality assurance objectives for analytical results are described in terms of precision, accuracy, completeness, comparability, and representativeness. However, AK documentation provides qualitative information that cannot be assessed according to specific data quality goals that are used for analytical techniques. Appropriate analytical and testing results are used to confirm the characterization of wastes based on AK (Section B4). To provide adequate control of AK activities and ensure that AK information is accurate, complete, and is representative of the waste stream being evaluated, the CCP applies the following data quality requirements to AK information.

The CCP complies with the following data quality requirements:

- Precision - Precision is the agreement among a set of replicate measurements without assumption of the knowledge of a true value. The qualitative determinations, such as compiling and assessing AK documentation, do not lend themselves to statistical evaluations of precision. However, the AK information is assessed by independent review during internal and external audits.

- Accuracy - Accuracy is the degree of agreement between an observed sample result and the true value. The percentage of waste containers which require reassignment to a new waste matrix code and/or designation of a different Hazardous Waste Code, based on the reevaluation of AK and sampling and analysis data is reported as a measure of AK accuracy. The CCP calculates the AK accuracy in accordance with CCP-TP-005, *CCP Acceptable Knowledge Documentation*.

- Completeness - Completeness is an assessment of the number of waste streams or number of samples collected to the number of samples determined to be useable through the data validation process. The AK record contains 100 percent of the required information (Section B4-3). The usability of the AK information is assessed for completeness during audits.

- Comparability - Data are considered comparable when one set of data can be compared to another set of data. The CCP ensures comparability by meeting the training requirements and complying with the minimum standards outlined for procedures that are used to implement the AK process. The CCP assign Hazardous Waste Codes in accordance with Section B4-4 and will provide the information regarding the waste being characterized to other sites who store or generate a similar waste stream.

- Representativeness - Representativeness expresses the degree to which sample data accurately and precisely represent characteristics of a population. Representativeness is a qualitative parameter that is satisfied by ensuring that the process of obtaining, evaluating, and documenting AK information is performed in accordance with the minimum standards established in Section B4. The CCP assesses and documents the limitations of the AK information used to assign Hazardous Waste Codes (e.g., purpose and scope of information, date of publication, type and extent to which waste parameters are addressed).

The CCP complies with the nonconformance notification and reporting requirements of Section B3-1 of this QAPjP if the results of confirmatory analytical techniques specified in this QAPjP are inconsistent with AK documentation.

In addition, performance with regard to the use of AK information is tracked by assessing the frequency of inconsistencies among information, and documenting the results of AK confirmation through radiography, VE, headspace gas analysis, and solidified waste analyses, as appropriate. The AK process and waste stream documentation are evaluated through internal assessments by QA organizations and assessments by auditors external to the organization (the Permittees).

B3-10 Data Review, Validation, and Verification Requirements

The CCP ensures through data review, validation, and verification that the data it generates satisfies the data generation, management, and reporting requirements contained in the WAP (NMED 1999). Responsibilities for data review, validation, and verification activities are defined at three levels (1) the data generation level, and (2) the project level, and (3) the Permittee level.

Data review, validation, and verification are performed at the CCP data generation level in accordance with CCP procedures. Data validation and verification are performed at the project level by the CCP project staff in accordance with CCP-TP-001, *CCP Project Level Data Validation and Verification*.

Data review determines whether raw data was properly collected and ensures that it was properly reduced. Data validation confirms that the reported data satisfy the WAP requirements and are accompanied by signature release. Data verification authenticates that the data are presented accurately, represent the sampling and analysis activities performed, and have been subject to the appropriate level of review. By meeting the requirements in this section, the CCP ensures that records furnish documentary evidence of quality.

Data from testing, sampling, analytical, or on-line operations are compiled at the data generation level and reported to the CCP site project office as testing, sampling, analytical, or on-line Batch Data Reports in either electronic or hard copy format. The requirements for compiling Batch Data Reports are described in Section B3-12.

The following types of Batch Data Reports (as applicable to the characterization process in use) are required for data validation and verification, and quality assurance activities:

- The Testing Batch Data Report or equivalent includes data pertaining to radiography or VE for up to 20 waste containers without regard to waste matrix. Table B3-11 lists the information required in Testing Batch Data Reports (identified with an “X”) and other information necessary for data validation but optional for inclusion in the Testing Batch Data Report (identified with an “O”)

- The Sampling Batch Data Report or equivalent includes sample collection data pertaining to a group of no more than 20 headspace gas or homogeneous waste samples that were collected for chemical analysis. Table B3-12 lists the information required in a Sampling Batch Data Report (identified with an "X") and other information not required in the Sampling Batch Data Report but necessary for data validation (indicated with an "O")

- The Analytical Batch Data Report or equivalent includes analytical data from the analysis of TRU waste for up to 20 headspace gas or homogeneous samples. Analytical Batch Data Reports or equivalent that contain results for composited headspace gas samples must contain sufficient information to identify the containers that were composited for each composite sample. Because Analytical Batch Data Reports are generated based on the number of samples analyzed, an Analytical Batch Data Report may contain results that are applicable to more than 20 containers depending on how many composite samples are part of the report, but may not exceed a total of 20 samples analyzed. Table B3-13 lists the information required in Analytical Batch Data Report (identified with an "X") and other information that is necessary for data validation, but is optional for Analytical Batch Data Reports (identified with an "O")

  Raw analytical data need not be included in Analytical Batch Data Reports, but is maintained in the CCP files and/or the site records system and is readily available for review upon request. Raw data may include analytical bench sheet and instrumentation readouts for calibration standard results, sample data, QC samples, sample preparation conditions and logs, sample run logs, and re-extraction, re-analysis, or dilution information pertaining to the individual samples. Raw data may also include calculation records and any qualitative or semi-quantitative data collected for a sample and that has been recorded on a bench sheet or in a log book.

- As applicable, On-line Batch Data Reports or their equivalent contain the combined information from the Sampling Batch Data Report and Analytical Batch Data Report that is relevant to the on-line method used

B3-10a Data Generation Level

The minimum requirements for raw data collection and management, as well as the definitions and limitations of testing, sampling, analytical, and on-line batches, are described in the data generation level procedures. The minimum requirements for raw data review include the following:

- Data are signed and dated in reproducible ink by the individual generating the data, or by use of unalterable electronic signature

- Data are recorded clearly, legibly, and accurately in field and laboratory records (i.e., bench sheets and logbooks) as applicable, and include applicable sample identification numbers (for sampling and analytical laboratories)

- Changes to original data are lined out, initialed, and dated by the individual making the change. A justification for changing the original data may also be included. Original data are not obliterated or otherwise disfigured so as to be unreadable. Data changes are made only by the individual who originally collected the data, or by an individual authorized to change the data.

- Data are transferred and reduced from field and laboratory records completely and accurately

- All field and laboratory records are maintained as specified in Table B-7

- Data are organized in standard formats (i.e., Batch Data Reports) specified in procedures

- Electronic and video data are stored appropriately to ensure that waste container, sample, and associated QC data are readily retrievable

Data generation level review, validation, and verification consists of reviews and signature release by an Independent Technical Reviewer (ITR), a Technical Supervisor (TS), and a Data Generation Level QA Officer. These activities are performed on 100 percent of the Batch Data Reports and in accordance with this QAPjP and implemented in the applicable procedures. Individuals conducting the data review, validation, and verification use checklists that address the items in this section. These checklists contain or reference tables showing the results of testing, sampling, analytical, or on-line batch QC samples, if applicable. Checklists reflect review of QC samples and QAOs in accordance with the criteria established in Tables B3-2 through B3-9, as applicable. Checklists are forwarded with Batch Data Reports to the CCP Site Project Office (SPO). Analytical raw data are available and reviewed by the data generation level reviewer; however, it does not need to be included in the Batch Data Report. Reviews are conducted as soon as possible following analytical activities, and are performed before any corresponding waste is shipped to WIPP.

B3-10a(1) Independent Technical Review

The independent technical reviewer ensures by review of raw data that data generation and reduction are technically correct, calculations are verified correct, deviations are documented, and QA/QC results are complete, documented correctly, and compared against the criteria specified in this QAPjP. This review is to validate and verify all of the work done by the originator.

One hundred percent of the Batch Data Reports receive an independent technical review. This review is performed by an individual other than the data generator who is qualified to perform the initial work. The independent technical review is performed as soon as practicably possible in order to determine and correct negative quality trends in the testing, sampling, analytical, and on-line process. However at a minimum, the independent technical review is performed before any waste associated with the data reviewed is shipped to the WIPP. The reviewer(s) release the data as evidenced by signature, and as a consequence ensure the following as applicable:

- Data generation and reduction were conducted in a technically correct manner in accordance with the methods used (procedure revision) and data were reported in the proper units
- Calculations were verified by a valid calculation program, a spot check of verified calculation programs, and/or 100 percent check of all hand calculations. Values that are not verifiable to within rounding or significant difference discrepancies are rectified prior to completion of independent technical review
- The data were reviewed for transcription errors
- QA documentation for Batch Data Reports is complete and includes, as applicable, raw data, calculation records, chain-of-custody forms, calibration records, (or reference to an available calibration package), and QC sample results, copies or originals of gas canister sample tags (if applicable). Corrective action is taken to ensure that all Batch Data Reports are complete and include all necessary raw data prior to completion of the independent technical review
- QC sample and analytical results are within established control limits, and if not, the data are appropriately qualified in accordance with data usability criteria (EPA 1994b and 1994c). Data outside of established control limits are assigned an appropriate qualifier flag, discussed in the case narrative, and included as appropriate in calculations for completeness
- Data qualifier flags specified in Table B3-14 were assigned correctly
- The sample holding time and preservation requirements were met, or exceptions documented
- Radiography tapes (or equivalent media) were reviewed (independent observation) on a waste container basis at a minimum of once per testing batch or once per day of operation, whichever is less frequent (Section B1-3b(2)); the radiography tape (or equivalent media) was reviewed against the data reported on the radiography form to ensure that the data are correct and complete

- Field sampling records are complete. Incomplete or incorrect field sampling records are subject to resubmittal prior to completion of the independent technical review

B3-10a(2) Technical Supervisor Review

The technical supervisor review ensures that the independent technical review is performed completely, the Batch Data Report is complete, and verifies that the results are technically reasonable. This review validates and verifies the characterization data obtained in this area is ready for data generation level QA officer review.

One hundred percent of the Batch Data Reports receive technical supervisory signature release for each testing batch, sampling batch, analytical batch, and on-line batch. The technical supervisory signature release occurs as soon as practicably possible after the independent technical review in order to determine and correct negative quality trends in the testing, sampling, analytical, or on-line process. However at a minimum, the technical supervisory signature release is performed before any waste associated with the data reviewed is shipped to the WIPP. This release ensures the following as applicable:

- The data are technically reasonable based on the technique used
- All data received independent technical review with the exception of radiography tapes, which receive periodic technical review as specified in Section B1-3b(2)
- The testing, sampling, or analytical data QA documentation for Batch Data Reports is complete and includes raw data (as applicable), calculation records, COC forms, calibration records, and QC sample results and original or copies of gas sample canister tags
- Sample holding time requirements are met, or exceptions documented
- Field sampling records are complete

B3-10a(3) QA Officer Review

The data generation level QA officer review ensures that the Batch Data Report is complete, that QC checks meet the acceptance criteria, and that appropriate QAOs are met. This review verifies and validates that the characterization results meet the program QA/QC, that instrument performance criteria are met, and that QAOs for the subject characterization area are met.

One hundred percent of the Batch Data Reports receive QA officer (or designee) signature release. The QA Officer signature release occurs as soon as practicably possible after the technical supervisory signature release in order to determine and correct negative quality trends in the testing, sampling, analytical, or on-line process. However at a minimum, the QA Officer signature release is performed before any waste associated with the data reviewed is shipped to the WIPP. This release ensures the following as applicable:

- Independent technical and technical supervisory reviews are performed as evidenced by the appropriate signature releases
- QA documentation for the Batch Data Report is complete as appropriate for the point of data generation
- Sampling and analytical QC checks are properly performed; QC criteria not met were documented
- QAOs are met according to the criteria outlined in Sections B3-2, B3-4, and B3-5 through B3-8, and Tables B3-2, B3-3, B3-4, and B3-5

B3-10b Project Level

Data validation and verification at this level involves scrutiny and signature release from the SPM and SPQAO or their designees. The procedure CCP-TP-001, *CCP Project Level Data Validation and Verification*, describes this process in detail. Any nonconformance identified during this process is documented on an NCR (Section B3-13).

The SPM and SPQAO ensure that a repeat of the data generation level review, verification and validation is performed on the data for a minimum of one randomly chosen waste container quarterly (every three months). This exercise documents that the data generation level review, verification, and validation is being performed in accordance with implementing procedures.

B3-10b(1) Site Project Quality Assurance Officer Review

The SPQAO review ensures that the Batch Data Reports received from the data generation level are complete, validates and verifies that the QC checks are done properly and meet the project criteria, and ensures that QAOs are met.

One hundred percent of the Batch Data Reports receive SPQAO signature release. The SPQAO signature release occurs as soon as possible in order to determine and correct negative quality trends in the testing, sampling, analytical, or on-line process.

However, at a minimum, the SPQAO signature release is performed before any waste associated with data reviewed is shipped to the WIPP. As described in CCP-TP-001, *CCP Project Level Data Validation and Verification* (including attached checklists), this signature release ensures the following as applicable:

- Batch Data Reports are complete and data are properly reported (i.e., data are reported in correct units and with correct data qualifying flags)
- Sampling batch QC checks (e.g., equipment blanks, field duplicates, on-line control samples) are properly performed, meet the established QAOs, and are within established data usability criteria (EPA 1994b and 1994c)
- Testing batch QC checks (e.g., replicate scans, measurement system checks) are properly performed. Radiography data are complete and acceptable based on evidence of videotape (or equivalent media) review of one waste container per day or once per testing batch, whichever is less frequent, as specified in Section B1-3b(2)
- Analytical batch QC checks (e.g., laboratory duplicates, laboratory blanks, matrix spikes, matrix spike duplicates, laboratory control samples) were properly performed and meet the established QAOs and are within established data usability criteria (EPA 1994b and 1994c)
- On-line batch QC checks (e.g., field blanks, on-line blanks, on-line duplicates, on-line control samples) were properly performed, meet the established QAOs, and are within established data usability criteria (EPA 1994b and 1994c)
- Proper procedures were followed to ensure representative samples for headspace gas, homogeneous solids, and soil/gravel were taken

B3-10b(2) Site Project Manager Review

The SPM review is the final validation that all of the data contained in Batch Data Reports are properly reviewed, as evidenced by signature release and completed checklists.

One hundred percent of the Batch Data Reports have SPM signature release. The SPM signature release occurs as soon as possible after the SPQAO signature release in order to determine and correct negative quality trends in the testing, sampling, analytical, and on-line process. However, at a minimum, the SPM signature release is performed before any

waste associated with data reviewed is shipped to the WIPP. As specified in CCP-TP-001, *CCP Project Level Data Validation and Verification*, this signature release ensures the following:

- Data generation level independent technical, technical supervisory, and QA officer (or designee) review, validation, and verification are performed as evidenced by completed review checklists and by the appropriate signature releases
- Batch data review checklists are complete
- Data are within established assessment criteria and meet applicable QAOs as described in Section B3-11

B3-10b(3) SPQAO Summary and SPM Data Validation Summary

To document the project level validation and verification described above, the SPQAO (or designee) prepares an SPQAO Summary, and the SPM (or designee) prepares the SPM Data Validation Summary in accordance with CCP-TP-001, *CCP Project Level Data Validation and Verification*. These reports may be combined to eliminate redundancy or incorporated into the SPQAO and SPM checklists. The SPQAO Summary includes a validation checklist for each Batch Data Report. Checklists for the SPQAO Summary are of sufficient detail to validate all aspects of a Batch Data Report that affect data quality.

The SPM Data Validation Summary provides confirmation that, on a per waste container basis as evidenced by Batch Data Report reviews, all data have been validated in accordance with this QAPjP. The SPM Data Validation Summary identifies each batch data report reviewed, describes how the validation was performed and whether or not problems were detected, and includes a statement indicating that data are acceptable.

Once the data have received project-level validation and verification or when the SPM decides the sample no longer needs to be retained, the SPM ensures that the laboratory is notified. Samples are retained by the laboratory until this notification is received. Gas sample canisters are then released from storage for cleaning, recertification, and subsequent reuse. Sample tags are removed and retained in the project files before recycling the canisters. If the SPM requests that samples or canisters be retained for future use (e.g., an experimental holding time study), the same sample identification and COC forms are used and cross-referenced to a document which specifies the purpose for sample or canister retention.

B3-10b(4) Preparing Waste Stream Characterization Packages

If requested by the Permittee, the CCP provides a Waste Stream Characterization Package. The SPM may require each characterization area data generation level technical supervisor, and QA officer to assist in the preparation and review of the Waste Stream Characterization Package (described in Section B3-12b(2)) as necessary to ensure the package supports the SPM's waste characterization determinations.

B3-10c Permittee Level

Not applicable to the CCP. This is a Permittee function.

B3-11 Reconciliation with Data Quality Objectives

Reconciling the results of waste testing and analysis with DQOs ensures that data are of adequate quality to support regulatory compliance programs. When waste is characterized by the CCP, reconciliation with the DQOs is the responsibility of the SPM and occurs prior to waste shipment. DQO reconciliation is performed according to CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*.

B3-11a Reconciliation at the Project Level

DQO reconciliation is the responsibility of the SPM, who assesses whether data of sufficient type, quality, and quantity to meet the DQOs (Section B-4a(1)) have been collected and determines whether the variability of the data set is small enough to provide the required confidence in the results. The SPM also determines whether, based on the desired error rates and confidence levels, a sufficient number of valid data points have been determined (as established by the associated completeness rate for each sampling and analytical process). The SPM documents that random sampling of containers was performed for the purposes of waste stream characterization.

As described in CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*, the SPM determines for each waste stream characterized, whether sufficient data have been collected to determine the following required waste parameters:

- Waste matrix code
- Waste material parameter weights
- That each container of waste is transuranic radioactive waste
- Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for each VOC in the headspace gas of waste containers in the waste stream (if applicable)

- Potential flammability of TRU waste headspace gases
- Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for VOCs, SVOCs, and metals in the waste stream
- Whether the waste stream exhibits a toxic characteristic or is listed under 40 CFR Part 261, Subpart C
- Whether the waste stream is classified as hazardous or nonhazardous at the 90 percent confidence level
- Whether a sufficient number of waste containers have been visually examined (as a QC check on radiography) to determine with a reasonable level of certainty that the UCL_{90} for the miscertification rate is less than 14 percent (if applicable)
- Whether all TICs were appropriately identified and reported in accordance with the requirements of Section B-3a(1) and B3-1 prior to submittal of a WSPF for a waste stream or waste stream lot
- Whether the overall completeness, comparability, and representativeness QAOs were met for the on-line, sampling, analytical, and testing procedures specified in Sections B3-2 through B3-9 prior to submittal of a WSPF for a waste stream or waste stream lot
- Whether the PRQLs for all analyses were met prior to submittal of a WSPF for a waste stream or waste stream lot

If the SPM determines that insufficient data have been collected to make the determinations listed above, additional data collection efforts are undertaken.

The reconciliation of a waste stream is performed prior to submittal of the WSPF for that waste stream. For subsequent shipments, data reconciliation is done on all containers or samples prior to shipment to WIPP. The CCP does not ship TRU waste to the WIPP unless the SPM determines that the WAP-required waste parameters listed above are met.

The statistical procedure presented in Section B2 shall be used by the SPM to evaluate and report waste characterization data from the analysis of homogeneous solids and soil/gravel. The procedure, which calculates UCL_{90} values, shall be used to assess compliance with the DQOs in Section B-4a(1) as well as with RCRA regulations. The procedure must be applied to all laboratory analytical data for total VOCs, total SVOCs, and total metals. For RCRA regulatory compliance (40 CFR § 261.24), data from the

analysis of the appropriate metals and organic compounds may be expressed as TCLP values or results may also be compared to the toxicity characteristic levels expressed as total values. These total values will be considered the regulatory threshold limit (RTL) values for the WAP. RTL values are obtained by calculating the weight/weight concentration (in the solid) of a toxicity characteristic analyte that would give the regulatory weight/volume concentration (in the TCLP extract), assuming 100-percent analyte dissolution.

B3-11b Reconciliation at the Permittee Level

Not applicable to the CCP. This is a Permittee function.

B3-12 Data Reporting Requirements

Data reporting requirements define the type of information and the method of transmittal for data transfer from the data generation level to the CCP site project office and from the CCP site project office to the Permittee.

B3-12a Data Generation Level

As described in the data generation procedures, data are transmitted by hard copy or electronically (with hard copies available on demand) from the data generation level to the CCP site project office. Transmitted data include all testing, sampling, analytical, and on-line Batch Data Reports, as well as data review checklists. The Batch Data Report forms and checklists must contain all the information required by the testing, sampling, and analytical techniques. Batch Data Reports and checklists are on approved forms as provided in procedures.

Batch Data Reports, with signatures indicating that independent technical reviews, technical supervisory reviews, and QA reviews were performed, are sent to the CCP Records Custodian. All Batch Data Reports are assigned serial numbers, and each page is numbered. The serial number may be the same as the testing, sampling, analytical, or on-line batch number.

QA documentation and records, including raw data, are maintained in the CCP files and/or the site records system files. Data generators forward their testing, sampling, analytical, and on-line QA documentation along with Batch Data Reports to the CCP Records Custodian.

B3-12b Project Level

The CCP site project office ensures that the Characterization Information Summary and Waste Stream Characterization Package (when requested by the Permittee) are prepared as appropriate. In addition, the CCP site project office prepares a WSPF for each waste stream certified for shipment to the WIPP. The SPQAO verifies these reports are consistent with information found in testing, sampling, analytical, or on-line Batch Data Reports. Summarized testing, sampling, analytical, and on-line data are included with the WSPF. The contents of the WSPF, the Characterization Information Summary, and the Waste Stream Characterization Package are discussed in the following sections.

Characterization Information Summaries and Waste Stream Characterization Packages are prepared in accordance with the CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*. A Waste Stream Characterization Package is submitted only when requested by the Permittee. These reports are reviewed, validated, and verified by the SPM.

B3-12b(1) Waste Stream Profile Form and Characterization Information Summary

The WSPF requires:

- Site name
- Site EPA ID.
- Date of audit report approval by NMED (if obtained)
- Assignment of waste stream description
- Summary category group
- Waste matrix code group
- Waste stream name
- Applicable U.S. EPA Hazardous Waste Codes
- Applicable TRUCON codes
- Certification signature of SPM, name, title, and date signed

The Characterization Information Summary includes the following elements:

- Data reconciliation with DQOs

- A cross-reference of container identification numbers with each Batch Data Report

- Headspace gas summary data listing the identification numbers of samples used in the statistical reduction, associated descriptive statistics (maximum, mean, standard deviation, RTL, and UCL_{90}), and associated Hazardous Waste Codes that were applied to the waste stream

- TIC listing and evaluation, and verification that AK was confirmed
- Radiography and VE summary to document that prohibited items are not present and to confirm AK
- AK summary, including waste stream name and number, the point of generation, waste stream volume, generation dates, TRUCON codes, TRU Waste Baseline Inventory Report (TWBIR) information, generation processes, RCRA determinations, and radionuclide information

After approval of a WSPF and the associated Characterization Information Summary by the Permittee, the CCP maintains a cross reference of container identification numbers to each Batch Data Report.

B3-12b(2) Waste Stream Characterization Package

The waste stream characterization package is submitted when requested by the Permittee and consists of the following:

- WSPF
- Applicable Characterization Information Summary
- Complete AK summary
- Batch Data Reports supporting the confirmation of AK as well as others requested by the Permittee

B3-12b(3) WIPP Waste Information System Data Reporting

The WWIS data dictionary includes the data, field formats, and limits associated with waste characterization data established by the WAP. These data are subject to edit and limit checks that are performed automatically by the database, as defined in the "WIPP Waste Information System User's Manual for Use by Shippers/Generators" (DOE 2001). If a container is part of a composite headspace gas sample, the analytical results from the composite sample is assigned as the container headspace gas data results, including associated TICs.

B3-13 Nonconformances

The status of CCP activities are monitored and controlled by the SPM and SPQAO in accordance with the nonconformance and procurement procedures identified below. This includes nonconformance identification, documentation, and reporting.

Nonconformances

Nonconformances are uncontrolled and unapproved deviations from an approved plan or procedure (e.g., this QAPjP). In the context of this QAPjP, deficiencies and nonconformances are synonymous. Nonconforming items and activities are those that do not meet the CCP requirements, procurement document criteria, or approved work procedures. The CCP personnel are responsible for promptly reporting any nonconformance to management. The CCP reconciles and corrects nonconformance items, as appropriate, in accordance with the DOE-CBFO QAPD (DOE 1999a). The disposition of nonconformaning items is identified and documented and nonconforming items are identified by marking, tagging, or segregating and appropriate notifications are made to the site. When a nonconformance related to the CCP is observed or detected, the SPM and the SPQAO are notified, and affected management reviews the content of the NCRs and assists the SPQAO in processing the NCR.

The CCP identifies and documents nonconformances as follows:

- Nonconforming items are addressed in CCP-QP-005, *CCP Nonconforming Item Reporting and Control*. This procedure establishes the method for CCP personnel to identify, document, control, and disposition nonconforming activities, processes, items, and materials. NCRs are initiated by any individual identifying a nonconformance during performance of work tasks, random observations, inspections, or any other review of CCP procedures, operations, and activities. The CCP personnel identify deficient items by marking, tagging, or segregating them. This procedure implements the requirements of Section 1.3.2.2 (Control of Conditions Adverse to Quality) of the DOE-CBFO QAPD (DOE 1999a)

- Procedure CCP-QP-006, *CCP Corrective Action Reporting and Control*, establishes the method for personnel to identify and correct potential problems and conditions adverse to quality, in addition to precluding their recurrence, and if necessary, stopping associated work activities. Any person may temporarily stop work prior to evaluation of the condition by the responsible CCP supervisor. The CCP supervisor then evaluates and reports the condition, as necessary, in accordance with CCP-QP-006, *CCP Corrective Action Reporting and Control*. This procedure implements the requirements of Section 1.3.2.4 (Corrective Action Planning and Follow-up) of the DOE-CBFO QAPD (DOE 1999a)

Management at all levels fosters a "no-fault" attitude to encourage the identification of nonconforming items and processes within the CCP. Nonconformances may be detected and identified by anyone performing activities in support of this QAPjP, including:

- The CCP project staff - during field operations, supervision of subcontractors, data validation and verification, and self-assessment
- The CCP data generation level staff personnel - during the preparation for and performance of testing, sampling, and analysis; calibration of equipment; QC activities; data review, validation, and verification; and self-assessment
- CCP QA personnel - during oversight or assessment activities

An NCR is prepared for each nonconformance identified. Each NCR is initiated by the individual(s) identifying the nonconformance. The NCR is then processed by qualified personnel. The NCR includes or references results of laboratory analysis, QC tests, audit reports, internal memoranda, or letters, as appropriate. The NCR provides the following information:

- Identification of the individual(s) identifying or originating the nonconformance
- Description of the nonconformance
- Method(s) or suggestions for correcting the nonconformance (corrective action)
- Schedule for completing the corrective action
- An indication of the potential ramifications and overall usability of the data, if applicable
- Any approval signatures specified in the nonconformance procedures

The SPQAO oversees the NCR process for the CCP, tracks the status of deficiencies, and is responsible for verifying the close-out of the NCRs.

Nonconformances are tracked and trended in accordance with CCP-QP-005, *CCP Nonconforming Item Reporting and Control*. This procedure establishes the method for evaluating trends in nonconformances and identifying appropriate corrective actions.

Documentation of NCRs is made available to the SPM, who ensures that relevant project personnel are notified of nonconformances.

The SPQAO provides written or electronic notification to Permittee of all non-administrative nonconformances (i.e., a failure to meet a DQO) first identified during the SPM review within five days of identification and validation. The SPQAO then provides an NCR to the Permittee within thirty (30) days of identification. The CCP implements a corrective action process and resolves identified nonconformances prior to shipment of any affected waste to the WIPP.

Permittees Corrective Action Process

This section is not applicable to the CCP. This section applies to the Permittees.

B3-14 Special Training Requirements and Certifications

The SPM is responsible for ensuring that all personnel maintain proficiency in the work performed and identifies additional training if required. CCP-QP-002, *CCP Training and Qualification Plan* describes the training and qualification requirements for CCP personnel and subcontracted personnel who perform work to support the CCP. In accordance with these plans, only personnel trained to applicable CCP-related plans and procedures perform CCP activities. Before performing CCP-related activities, assigned staff receive indoctrination into the scope, purpose, and objectives of the WAP and the specific QAOs of assigned tasks. Personnel assigned to perform activities under this QAPjP have the education and training applicable to the functions associated with the work.

Documentation of training, consisting of training records that specify the scope of training, dates of completion, and job proficiency are maintained by the CCP site project office and/or the site records system as QA records. Personnel assigned to perform analytical or radiography activities for the CCP have obtained the education, experience, and training applicable to their work activities as summarized in Table B3-10. The requirements in the table are based on EPA's *Contract Laboratory Program Statement of Work for Organics Analysis* (EPA 1999b). Analytical laboratory line management ensures that analytical personnel are qualified to perform the analytical methods for which they are responsible.

Evaluation of CCP personnel qualifications includes a comparison of the job description to the skills, training, and experience included in the individual's resume, training records, and other documented bases for job assignment. This evaluation is also performed for personnel who change positions because of a transfer or promotion as well as personnel assigned to short-term or temporary work assignments that may affect the quality of CCP activities.

Evidence of personnel proficiency and demonstration of competence in the task(s) assigned are demonstrated and documented. All personnel designated to work on specific aspects of the WAP maintain qualification (i.e., training and certification)

throughout the duration of the work as specified in this QAPjP and applicable procedures. Job performance is evaluated and documented at periodic intervals, as specified in the appropriate implementing procedures.

CCP personnel involved in WAP activities (as flowed down in this QAPjP) receive continuing training to ensure that job proficiency is maintained and documented. Training includes both education in principles and enhancement of skills. Job performance is evaluated and documented at periodic intervals, as specified in the implementing procedures or in the CCP-QP-002, *CCP Training and Qualification Plan*. The CCP facility managers are responsible for ensuring the continued job performance proficiency for CCP personnel and identifying the training requirements for each project position.

B3-15 Changes to WAP Related Plans or Procedures

Controlled changes to WAP-related CCP plans or procedures are managed through the document control process (CCP-QP-007, *CCP Document Control*) and described in the QAPD. The SPM and SPQAO review all nonadministrative changes and evaluate whether those changes could impact DQOs specified in the WAP. Any changes to the WAP-related plans or procedures that could impact DQOs are reported to the Permittee within five days of identification by the project level review in accordance with CCP-QP-010, *CCP Document Preparation and Approval*. The CCP reports any changes to the CCP plans and procedures on a monthly basis to the DOE-CBFO, in accordance with CCP-QP-019, *CCP Quality Assurance Reporting to Management*.

Table B3-1 Waste Material Parameters and Descriptions

Waste Material Parameter	Description
Iron-Based Metals/Alloys	Iron and steel alloys in the waste excluding the waste container materials.
Aluminum-Based Metals/Alloys	Aluminum or aluminum-based alloys in the waste materials.
Other Metals	All other metals found in the waste materials (e.g., copper, lead, zirconium, tantalum, etc.)
Other Inorganic Materials	Non-metallic inorganic waste, including concrete, glass, firebrick, ceramics, sand, and inorganic sorbents.
Cellulosics	Materials generally derived from high polymer plant carbohydrates (e.g., paper, cardboard, wood, cloth).
Rubber	Natural or man-made elastic latex materials (e.g., surgeon's gloves, leaded rubber gloves).
Plastics (Waste Materials)	Generally man-made materials, often derived from petroleum feedstock (e.g., polyethylene, polyvinyl chloride).
Organic Matrix	Cemented organic resins, solidified organic liquids and sludges.
Inorganic Matrix	Any homogeneous materials consisting of sludge or aqueous-based liquids that are solidified with cement, calcium silicate, or other solidification agents; (e.g., waste water treatment sludge, cemented aqueous liquids, and inorganic particulates).
Soils/Gravel	Generally consists of naturally-occurring soils that have been contaminated with inorganic waste materials.
Steel (Packaging Materials)	208-liter (55-gal.) drums.
Plastics (Packaging Materials)	90-mil polyethylene drum liner and plastic bags.

Table B3-2 Gas Volatile Organic Compound Target Analyte List and Quality Assurance Objectives

Compound	CAS Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b] (ng)	PRQL (ppmv)	Completeness (%)
Benzene	71-43-2	≤25	70-130	10	10	90
Bromoform	75-25-2	≤25	70-130	10	10	90
Carbon tetrachloride	56-23-5	≤25	70-130	10	10	90
Chlorobenzene	108-90-7	≤25	70-130	10	10	90
Chloroform	67-66-3	≤25	70-130	10	10	90
1,1-Dichloroethane	75-34-3	≤25	70-130	10	10	90
1,2-Dichloroethane	107-06-2	≤25	70-130	10	10	90
1,1-Dichloroethylene	75-35-4	≤25	70-130	10	10	90
cis-1,2-Dichloroethylene	156-59-2	≤25	70-130	10	10	90
Ethyl benzene	100-41-4	≤25	70-130	10	10	90
Ethyl ether	60-29-7	≤25	70-130	10	10	90
Formaldehyde[c]	50-00-0	≤25	70-130	10	10	90
Hydrazine[d]	302-01-2	≤25	70-130	10	10	90
Methylene chloride	75-09-2	≤25	70-130	10	10	90
1,1,2,2-Tetrachloro-ethane	79-34-5	≤25	70-130	10	10	90
Tetrachloroethylene	127-18-4	≤25	70-130	10	10	90
Toluene	108-88-3	≤25	70-130	10	10	90
1,1,1-Trichloroethane	71-55-6	≤25	70-130	10	10	90
Trichloroethylene	79-01-6	≤25	70-130	10	10	90
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	≤25	70-130	10	10	90
m-Xylene[e]	108-38-3	≤25	70-130	10	10	90
o-Xylene	95-47-6	≤25	70-130	10	10	90
p-Xylene[e]	106-42-3	≤25	70-130	10	10	90
Acetone	67-64-1	≤25	70-130	150	100	90
Butanol	71-36-3	≤25	70-130	150	100	90
Methanol	67-56-1	≤25	70-130	150	100	90
Methyl ethyl ketone	78-93-3	≤25	70-130	150	100	90
Methyl isobutyl ketone	108-10-1	≤25	70-130	150	100	90

[a] Criteria apply to concentrations exceeding the PRQL.
[b] Values based on delivering 10 mL to the analytical system
[c] Required only for homogeneous solids and soil/gravel from Los Alamos National Laboratory.
[d] Required only for homogeneous solids and soil/gravel from Oak Ridge National Laboratory and the Savannah River Site.
[e] These xylene isomers cannot be resolved by gas chromatography/mass spectroscopy.

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit
PRQL = Program required quantitation limit

Table B3-3 Summary of Laboratory Quality Control Sample Frequencies and Acceptance Criteria for Gas Volatile Organic Compounds Analysis

Quality Control (QC) Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Method Performance Samples	Seven samples initially and four semi-annually	Meet Table B3-2 Quality Assurance Objectives (QAOs)	Repeat until acceptable
On-Line Duplicates	One per on-line batch	Relative Percent Difference (RPD) $\leq$ 25% [b]	Nonconformance if RPD > 25%
On-Line Blanks	Daily prior to sample analysis for GC/MS and GC/FID. Otherwise, daily prior to sample analysis and once per on-line batch.	Analyte amounts • 3 x Method Detection Limits (MDLs) for GC/MS and GC/FID	Flag data with a "B" if analyte amounts exceed acceptance criteria
On-Line Control Samples	One per on-line batch	70-130 Percent Recovery (%R)	Nonconformance if %R < 70 or >130
Blind Audit Samples	Samples and frequency controlled by the Headspace Gas PDP Plan [c]	Specified in the Headspace PDP Plan [c]	Specified in the Headspace Gas PDP Plan [c]

[a] Corrective action when QC samples do not meet the acceptance criteria.
[b] Applies only to concentrations greater than the PRQLs listed in Table B3-2.
[c] Performance Demonstration Program Plan for the Analysis of Simulated Headspace Gas for the TRU Waste Characterization Program, (DOE 2001a).

Table B3-4 Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives

Compound	CAS Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Complete-ness (%)
Benzene	71-43-2	45	37-151	1	10	90
Bromoform	75-25-2	47	45-169	1	10	90
Carbon disulfide	75-15-0	50	60-150	1	10	90
Carbon tetrachloride	56-23-5	30	70-140	1	10	90
Chlorobenzene	108-90-7	38	37-160	1	10	90
Chloroform	67-66-3	44	51-138	1	10	90
1,4-Dichlorobenzene[c]	106-46-7	60	18-190	1	10	90
ortho-Dichlorobenzene[c]	95-50-1	60	18-190	1	10	90
1,2-Dichloroethane	107-06-2	42	49-155	1	10	90
1,1-Dichloroethylene	75-35-4	250	D-234[d]	1	10	90
Ethyl benzene	100-41-4	43	37-162	1	10	90
Methylene chloride	75-09-2	50	D-221[d]	1	10	90
1,1,2,2-Tetrachloroethane	79-34-5	55	46-157	1	10	90
Tetrachloroethylene	127-18-4	29	64-148	1	10	90
Toluene	108-88-3	29	47-150	1	10	90
1,1,1-Trichloroethane	71-55-6	33	52-162	1	10	90
1,1,2-Trichloroethane	79-00-5	38	52-150	1	10	90
Trichloroethylene	79-01-6	36	71-157	1	10	90
Trichlorofluoromethane	75-69-4	110	17-181	1	10	90
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	50	60-150	1	10	90
Vinyl chloride	75-01-4	200	D-251[d]	1	4	90
m-xylene	108-38-3	50	60-150	1	10	90
o-xylene	95-47-6	50	60-150	1	10	90
p-xylene	106-42-3	50	60-150	1	10	90
Acetone	67-64-1	50	60-150	10[e]	100	90
Butanol	71-36-3	50	60-150	10[e]	100	90
Ethyl ether	60-29-7	50	60-150	10[e]	100	90
Formaldehyde[f]	50-00-0	50	60-150	10[e]	100	90
Hydrazine[g]	302-01-2	50	60-150	10[e]	100	90
Isobutanol	78-83-1	50	60-150	10[e]	100	90
Methanol	67-56-1	50	60-150	10[e]	100	90
Methyl ethyl ketone	78-93-3	50	60-150	10[e]	100	90
Pyridine[c]	110-86-1	50	60-150	10[e]	100	90

Table B3-4 Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives (continued)

[a] Applies to laboratory control samples and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

[b] TCLP MDL and PRQL values are reported in units of mg/l and limits are reduced by a factor of 20.

[c] Can also be analyzed as a semi-volatile organic compound. If analyzed as a semi-volatile compound, the QAOs of Table B3-6 apply.

[d] Detected; result must be greater than zero.

[e] Estimate, to be determined.

[f] Required only for homogeneous solids and soil/gravel from Los Alamos National Laboratory.

[g] Required only for homogeneous solids and soil/gravel from Oak Ridge National Laboratory and Savannah River Site.

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit (maximum permissible value) (milligrams per kilogram)
PRQL = Program required quantitation limit; calculated from the toxicity characteristic level for benzene assuming a 0.9 oz (25-gram [g]) sample, 0.1 gal (0.5 liter [L]) of extraction fluid, and 100 percent analyte extraction (milligrams per kilogram)

Table B3-5 Summary of Laboratory Quality Control Samples and Frequencies for Volatile Organic Compounds Analysis

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Method performance samples	Seven (7) samples initially and four (4) semiannually	Meet Table B3-4 QAOs	Repeat until acceptable
Laboratory duplicates[b]	One (1) per analytical batch	Meet Table B3-4 precision QAOs	Nonconformance if RPDs > values in Table B3-4
Laboratory blanks	One (1) per analytical batch	Analyte concentrations # 3 x MDLs	Nonconformance if analyte concentrations > 3 x MDLs
Matrix spikes[b]	One (1) per analytical batch	Meet Table B3-4 accuracy QAOs	Nonconformance if %Rs are outside the range specified in Table B3-4
Matrix spike duplicates	One (1) per analytical batch	Meet Table B3-4 accuracy and precision QAOs	Nonconformance if RPD values and %Rs outside range specified in Table B3-4
Laboratory control samples	One (1) per analytical batch	Meet Table B3-4 accuracy QAO's	Nonconformance if %R < 80 or > 120
GC/MS Calibration	BFB Tune every 12 hours 5-pt. Initial Calibration initially, and as needed	Abundance criteria met as per method Calibrate according to SW-846 Method requirements: %RSD for CCC # 30, %RSD for all other compounds # 15% Average response factor used if %RSD # 15, use linear regression if %RSD >15; R or R^2 $ 0.990 if using alternative curve System Performance Check Compound (SPCC) minimum average response factor as per SW-846 Method; RRF for all other compounds $ 0.01	Repeat until acceptable

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
GC/MS Calibration (continued)	Continuing Calibration every 12 hours	%D 20 for CCC; SPCC minimum average response factor as per SW-846 Method; RRF for all other compounds 0.01 RT for internal standard must be ± 30 seconds from last daily calibration, internal standard area count must be >50% and <200% of last daily calibration	Repeat until acceptable
GC/FID Calibration	3-pt. Initial Calibration initially and as needed Continuing Calibration every 12 hours	Correlation Coefficient $ 0.990 or %RSD # 20 for all analytes %D or %Drift for all analytes # 15 of expected values, RT ± 3 standard deviations from initial RT calibration per applicable SW-846 Method	Repeat until acceptable.
Surrogate compounds	Each analytical sample	Average %R from minimum of 30 samples for a given matrix ±3 standard deviations	Nonconformance if %R < (average %R - 3 standard deviation) or > (average %R + 3 standard deviation)
Blind audit samples	Samples and frequency controlled by the Solid PDP Plan [c]	Specified in the Solid PDP Plan [c]	Specified in the Solid PDP Plan [c]

[a] Corrective Action per section B3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedances.

[b] May be satisfied using matrix spike duplicate; acceptance criteria applies only to concentrations greater than the PRQLs listed in Table B3-4.

[c] *Performance Demonstration Program Plan for RCRA Constitution Analysis of Solidified Wastes* (DOE 2001b).

MDL = Method detection limit
QAO = Quality assurance objective
PDP = Performance Demonstration Program
%R = Percent recovery
RPD = Relative percent difference

Table B3-6 Semi-Volatile Organic Compound Target Analyte List and Quality Assurance Objectives

Compound	CAS Number	Precision[a] (%RSD or RPD)	Accuracy [a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Completeness (%)
Cresols	1319-77-3	50	25-115	5	40	90
1,4-Dichlorobenzene[bc]	106-46-7	86	20-124	5	40	90
ortho-Dichlorobenzene[c]	95-50-1	64	32-129	5	40	90
2,4-Dinitrophenol	51-28-5	119	D-172[e]	5	40	90
2,4-Dinitrotoluene	121-14-2	46	39-139	0.3	2.6	90
Hexachlorobenzene	118-74-1	319	D-152[e]	0.3	2.6	90
Hexachloroethane	67-72-1	44	40-113	5	40	90
Nitrobenzene	98-95-3	72	35-180	5	40	90
Polychlorinated Biphenyls						
Aroclor 1016[d]	12674-11-2	33	50-114	5	40	90
Aroclor 1221[d]	11104-28-2	110	15-178	5	40	90
Aroclor 1232[d]	11141-16-5	128	10-215	5	40	90
Aroclor 1242[d]	53469-21-9	49	39-150	5	40	90
Aroclor 1248[d]	12672-29-6	55	38-158	5	40	90
Aroclor 1254[d]	11097-69-1	62	29-131	5	40	90
Aroclor 1260[d]	11096-82-5	56	8-127	5	40	90
Pentachlorophenol	87-86-5	128	14-176	5	40	90
Pyridine[c]	110-86-1	50	25-115	5	40	90

[a] Criteria apply to PRQL concentrations
[b] TCLP MDL and PRQL values are reported in units of mg/l and limits are reduced by a factor of 20.
[c] Can also be analyzed as a volatile organic compound
[d] Required only for waste matrix code S3220 (organic sludges)
[e] Detected; result must be greater than zero

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit (maximum permissible value) (milligrams per kilogram)
PRQL = Program required quantitation limit; calculated from the toxicity characteristic level for nitrobenzene assuming a 100-gram (g) sample, 0.5 gal (2 liter [L]) of extraction fluid, and 100 percent analyte extraction (milligrams per kilograms)

Table B3-7 Summary of Laboratory Quality Control Samples and Frequencies for Semi-volatile Organic Compounds

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Method performance samples	Seven (7) samples initially and four (4) semiannually	Meet Table B3-6 QAOs	Repeat until acceptable
Laboratory duplicates[b]	One (1) per analytical batch	Meet Table B3-6 precision QAOs	Nonconformance if RPDs > values in Table B3-6
Laboratory blanks	One (1) per analytical batch	Analyte concentrations # 3 x MDLs	Nonconformance if analyte concentrations > 3 x MDLs
Matrix spikes	One (1) per analytical batch	Meet Table B3-6 accuracy QAOs	Nonconformance if RPDs > values and %Rs outside range specified in Table B3-6
GC/MS Calibration	DFTPP Tune every 12 hours 5-pt. Initial Calibration initially, and as needed Continuing Calibration every 12 hours	Abundance criteria met as per method Calibrate according to SW-846 Method requirements: %RSD for CCC # 30, %RSD for all other compounds # 15% Average response factor used if %RSD # 15, use linear regression if >15; R or R^2 $0.990 if using alternative curve System Performance Check Compound (SPCC) minimum average response factor as per SW-846 Method; average response factor for all other compounds $ 0.01 %D# 20 for CCC, SPCC minimum average response factor as per SW-846 Method; average response factor for all other compounds $ 0.01 RT for internal standard must be ± 30 seconds from last daily calibration, internal standard area count must be >50% and <200% of last daily calibration	Repeat until acceptable

Table B3-7 Summary of Laboratory Quality Control Samples and Frequencies for Semi-volatile Organic Compounds (continued)

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
GC/ECD Calibration	5 pt. Initial Calibration initially and as needed Continuing Calibration every 12 hours	Correlation Coefficient $ 0.990 or %RSD < 20 for all analytes %D or %Drift for all analytes # 15 of expected values, RT ± 3 standard deviations of initial RT calibration per applicable SW-846 Method	Repeat until acceptable
Matrix spike duplicates	One (1) per analytical batch	Meet Table B3-6 accuracy and precision QAOs	Nonconformance if RPDs and %Rs > values in Table B3-6
Laboratory control samples	One (1) per analytical batch	Meet Table B3-6 accuracy QAO's	Nonconformance if %R < 80 or > 120
Surrogate compounds	Each analytical sample	Average %R from minimum of 30 samples from a given matrix ±3 standard deviations	Nonconformance if %R < (average %R - 3 standard deviations) or > (average %R + 3 standard deviations)
Blind audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan [c]	Specified in the Solid PDP Plan [c]

[a] Corrective action per section B3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedances.

[b] May be satisfied by using matrix spike duplicate; acceptance criteria applies only to concentrations greater than the PRQLs listed in Table B3-6.

[c] *Performance Demonstration Program Plan for RCRA Constitution Analysis of Solidified Wastes* (DOE 2001b).

MDL = Method detection limit
QAO = Quality assurance objective
PDP = Performance demonstration program
%R = Percent recovery
RPD = Relative percent difference

Table B3-8 Metals Target Analyte List and Quality Assurance Objectives

Analyte	CAS Number	Precision (%RSD or RPD)[a]	Accuracy (%R)[b]	PRDL[d] (µg/L)	PRQL[c] (mg/kg)	Completeness (%)
Antimony	7440-36-0	30	80-120	100	100	90
Arsenic	7440-38-2	30	80-120	100	100	90
Barium	7440-39-3	30	80-120	2000	2000	90
Beryllium	7440-41-7	30	80-120	100	100	90
Cadmium	7440-43-9	30	80-120	20	20	90
Chromium	7440-47-3	30	80-120	100	100	90
Lead	7439-92-1	30	80-120	100	100	90
Mercury	7439-97-6	30	80-120	4.0	4.0	90
Nickel	7440-02-0	30	80-120	100	100	90
Selenium	7782-49-2	30	80-120	20	20	90
Silver	7440-22-4	30	80-120	100	100	90
Thallium	7440-28-0	30	80-120	100	100	90
Vanadium	7440-62-2	30	80-120	100	100	90
Zinc	7440-66-6	30	80-120	100	100	90

[a] # 30 percent control limits apply when sample and duplicate concentrations are $ 10 x IDL for ICP-AES and AA techniques, and $ 100 x IDL for Inductively Coupled Plasma—Mass Spectrometry (ICP-MS) techniques. If less than these limits, the absolute difference between the two values shall be less than or equal to the PRQL.

[b] Applies to laboratory control samples and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

[c] TCLP PRQL values are reported in units of mg/l and limits are reduced by a factor of 20.

[d] PRDL set such that it is a factor of 10 below the PRQL for 100 percent solid samples, assuming a 100x dilution during digestion.

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
PRDL = Program required detection limit (i.e., maximum permissible value for IDL) (micrograms per liter)
PRQL = Program required quantitation limit (milligrams per kilogram)

Table B3-9 Summary of Laboratory Quality Control Samples and Frequencies for Metals Analysis

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Method performance samples	Seven (7) samples initially and four (4) semiannually	Meet Table B3-8 QAOs	Repeat until acceptable
Laboratory blanks	One (1) per analytical batch	# 3 x IDL (# 5 x IDL for ICP-MS)[b]	Redigest and reanalyze any samples with analyte concentrations which are #10 x blank value and $ 0.5 x PRQL
Matrix spikes	One (1) per analytical batch	Meet Table B3-8 accuracy QAOs	Nonconformance if %R outside the range specified in Table B3-8
Matrix spike duplicates	One (1) per analytical batch	Meet Table B3-8 accuracy and precision QAOs	Nonconformance if RPDs > values and %Rs outside the range specified in Table B3-8
ICP-MS Tune (ICP-MS Only)	Daily	4 Replicate %RSD # 5; mass calibration within 0.9 amu; resolution < 1.0 amu full width at 10% peak height	Nonconformance if %RSD > 5; mass calibration > 0.9 amu; resolution > 1.0 amu
Initial Calibration 1 blank, 1 standard (ICP, ICP-MS) 3 standard, 1 blank (GFAA, FLAA) 5 standard, 1 blank (CVAA, HAA)	Daily	90-110 %R (80-120% for CVAA, GFAA, HAA, FLAA) for initial calibration verification solution. Regression coefficient $ 0.995 for FLAA, CVAA, GFAA, HAA	Correct problem and recalibrate; repeat initial calibration
Continuing Calibration	Every 10 samples and beginning and end of run	90-110% for continuing calibration verification solution. (80-120% for CVAA, GFAA, HAA, FLAA)	Correct problem and recalibrate; rerun last 10 samples
Internal Standard Area Verification (ICP-MS)	Every Sample	Meet SW-846 Method 6020 criteria	Nonconformance if not reanalyzed at 5 X dilution until criteria are met
Serial Dilution (ICP, ICP-MS)	One (1) per analytical batch	5 X dilution must be #10% D of initial value for sample > 50xIDL	Flag Data if >10% and > 50xIDL

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Interference Correction Verification (ICP, ICP-MS)	Beginning and end of run or every 12 hours (8 for ICP) whichever is more frequent	80-120% recovery for analytes Note: Acceptance Criteria and Corrective Action apply only if interferents found in samples at levels greater than ICS A Solution	Correct problem and recalibrate, nonconformance if not corrected
Laboratory Control Samples	One (1) per analytical batch	Table B3-8 accuracy QAOs	Redigest and reanalyze for affected analytes; non conformance if not reanalyzed
Blind audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

[a] Corrective action per section B3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedances.
[b] Applies only to concentrations greater than the PRQLs listed in Table B3-8.

IDL = Instrument Detection Limit
PDP = Performance Demonstration Program
PRQL= Program Required Quantitation Limit
%R = Percent Recovery
RPD = Relative Percent Difference

Table B3-10 Minimum Training and Qualification Requirements

Personnel	Requirements[a]
Radiography Operators[c]	Site-specific training based on waste matrix codes and waste material parameters as described in Section B3-4; requalification every 2 years
Gas Chromatography Technical Supervisors[b] Gas Chromatography Operators[c]	Bachelor of Science (BS) or equivalent experience and 6 months previous applicable experience
Gas Chromatography/Mass Spectrometry Operators[c] Mass Spectrometry Operators[c]	BS or equivalent experience and 1 year independent spectral interpretation or demonstrated expertise
Gas Chromatography/Mass Spectrometry Technical Supervisors[b] Mass Spectrometry Technical Supervisors[b] Atomic Absorption Spectroscopy Technical Supervisors[b] Atomic Absorption Spectroscopy Operators[c] Atomic Mass Spectrometry Operators[c] Atomic Emission Spectroscopy Operators[c]	BS or equivalent experience and 1 year applicable experience
Atomic Mass Spectrometry Technical Supervisors[b]	BS and specialized training in Atomic Mass Spectrometry and 2 years applicable experience
Atomic Emission Spectroscopy Technical Supervisors[b]	BS and specialized training in Atomic Emission Spectroscopy and 2 years applicable experience

[a] Based on requirements contained in U.S. EPA Contract Laboratory Program Statement of Work for Organics Analysis (Document Number OLM 01.0) and Statement of Work for Inorganic Analysis (Document Number ILM 03.0).

[b] Technical Supervisors are responsible for the overall technical operation and development of a specific laboratory technique.

[c] Operators are responsible for the actual operation of analytical equipment.

Table B3-11 Testing Batch Data Report Contents

Required Information	Radiography	VE as a QC Check on Radiography	Visual Verification of AK[a]	Comment
Batch Data Report date	X	X	X	
Batch number	X	X	X	
Waste container number	X	X	X	
Waste stream name and/or number	O	O	O	
Waste matrix code	X	X	X	Summary Category Group included in waste matrix code
Implementing procedure (specific version used)	X	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to track specific version used.
Container type	O	O	O	Drums, Pipe Overpack, SWB, TDOP, etc.
Videotape reference	X	X		Reference to videotapes is applicable to each container. For VE (for characterization) for newly generated waste, videotape is not required if two trained operators review the contents of the waste container to ensure correct reporting.
Imaging check	O			
Camera check		O		
Audio check	O	O		
QC check of scales		O	O	Available documented evidence that calibrated scales were used. Only applicable if items are weighed during the VE.
QC documentation	X	X	X	

Table B3-11 Testing Batch Data Report Contents (continued)

Required Information	Radiography	VE as a QC Check on Radiography	Visual Verification of AK[a]	Comment
Description of liners and layer of confinement (if possible)	X	X	X	
Indication of vented rigid liners	O	X	X	Only required for containers with rigid liners. If Radiography is used to verify, then include in testing Batch Data Report.
Description of container contents	X	X	X	Provide enough detail for verification of estimated weights for the 12 waste material parameters.
Verification that the physical form matches the waste stream description and waste matrix code	X	X	X	Summary Category Group included in waste matrix code.
Indication of sealed containers >4L	X	X	X	
Amount of free liquids	X	X	X	
Estimated weights for the 12 waste matrix parameters	X	X	X	Table B3-1 lists waste matrix parameters.
Container gross weight	X	X	X	
Container empty weight	O	O	O	Established, documented empty container weights can be used.
Comments	X	X	X	
Reference to or copy of associated NCRs, if any	X	X	X	Copies of associated NCRs must be available.
Visual examination expert decisions		X		Only applicable if VE expert is consulted during VE.
Verify absence of prohibited items	X	X	X	

Table B3-11 Testing Batch Data Report Contents (continued)

Required Information	Radiography	VE as a QC Check on Radiography	Visual Verification of AK[a]	Comment
Operator signature and date of test	X	X	X	Two signatures required for visual verification of AK[a].
Signature of VE expert and date		X		When VE expert is consulted.
Data review checklists	X	X	X	

LEGEND:
X = Required in Batch Data Report
O = Information must be documented and traceable; inclusion in Batch Data Report is optional.

[a] VE technique as it applies to newly generated waste.

Table B3-12 Sampling Batch Data Report Contents

Required Information	Headspace Gas	Homogeneous Solids	Comment
Batch Data Report date	X	X	
Batch number	X	X	
Waste stream name and/or number	O	O	
Waste matrix code		X	Summary Category Group included in Waste Matrix Code.
Procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to denote the version used.
Container number	X	X	
Container type	O	O	Drum, Pipe Overpack, SWB, TDOP, etc.
Sample matrix and type	X	X	
Analyses requested and laboratory	X	X	
Point of origin for sampling	X	X	Location where sample was taken (e.g., building number, room)
Sample number	X	X	
Sample size	X	X	
Sample location	O	O	Location within container where sample is taken. For headspace gas, specify what layer of confinement was sampled. For solids, physical location within container.
Sample preservation	X	X	
Person collecting sample	X	X	
Person attaching custody seal	O	O	May or may not be the same as the person collecting the sample
Chain of custody record	X	X	Original or copy is attached

Table B3-12 Sampling Batch Data Report Contents (continued)

Required Information	Headspace Gas	Homogeneous Solids	Comment
Sampling equipment numbers	X	X	For disposable equipment, a reference to the lot
Cross-reference of sampling equipment numbers to associated cleaning batch numbers	O	X	As applicable to the equipment used for the sampling. For disposable equipment, a reference to the lot and procurement records to support cleanliness is sufficient.
Drum age	O		
Equilibration time	O		
Verification of rigid liner venting	O		Only applicable to containers with rigid liners
Verification that sample volume taken is small in comparison to the available volume	O		Must include headspace gas volume when it can be estimated.
Scale calibration		O	Must have reference to calibration records
Depth of waste		X	For newly generated waste, if sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.
Calculation of core recovery		X	For newly generated waste, if sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.
Co-located core description		X	For newly generated waste, if sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.
Time between coring and subsampling		X	Only applicable to coring
OVA calibration and reading	O		Only applicable to manifold systems. Must be done in accordance with manufacturer's specifications.
Field Records	X	X	Must contain the following as applicable to the sampling method used: Collection problems; sequence of sampling collection; and ambient temperature and pressure.

Table B3-12 Sampling Batch Data Report Contents (continued)

Required Information	Headspace Gas	Homogeneous Solids	Comment
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Operator signature and date and time of sampling	X	X	
Data review checklists	X	X	

LEGEND:
X = Required in Batch Data Report
O = Information must be documented and traceable; inclusion in Batch Data Report is optional.

Table B3-13 Analytical Batch Data Report Contents

Required Information	Headspace Gas	Homogeneous Solids	Comment
Batch Data Report date	X	X	
Batch number	X	X	
Sample numbers	X	X	
QC designation for sample	X	X	
Implementing procedure (specific version used)	X	X	If the procedure cited contains more than one method, the method used must also be cited. Use revision number, date, or other means to track version used.
QC sample results	X	X	
Sample data forms	X	X	Form should contain reduced data for target analytes and TICs.
Chain of custody	X	X	Original or copy
Gas canister tags	X		Original or copy
Sample preservation	X	X	
Holding time		O	
Cross-reference of field numbers to laboratory sample numbers	X	X	
Date and time analyzed	O	O	
Confirmation of spectra used for results	O	O	Analyst must qualitatively evaluate the validity of the results based on the spectra. Can be implemented as a check box for each sample.
TIC evaluation	O	O	
Reporting flags, if any	X	X	Table B3-14 lists applicable flags.
Case narrative	X	X	

Required Information	Headspace Gas	Homogeneous Solids	Comment
Reference/copy of any associated NCRs	X	X	Copies of associated NCRs must be available.
Operator signature and analysis date	O	O	
Data review checklists	X	X	

LEGEND:
X = Required in Batch Data Report;
O = Information must be documented and traceable; inclusion in Batch Data Report is optional.

Table B3-14 Data Reporting Flags

Data Flag	Indicator
B	Analyte detected in blank (Organics/Headspace gases)
B	Analyte blank concentration greater than or equal to 20 percent of sample concentration prior to dilution corrections (Metals)
E	Analyte exceeds calibration curve (Organics/Headspace gases)
J	Analyte less than PRQL but greater than or equal to the MDL (Organics/Headspace gases)
J	Analyte greater than or equal to IDL but less than 5 times the IDL before dilution correction (Metals)
U	Analyte was not detected and value is reported as the MDL (IDL for Metals)
D	Analyte was quantified from a secondary dilution, or reduced sample aliquot (Organics/Headspace gases)
Z	One or more QC samples do not meet acceptance criteria
H	Holding time exceeded

B4 ACCEPTABLE KNOWLEDGE

B4-1 Introduction

The RCRA regulations codified in 40 CFR and the New Mexico Hazardous Waste Management Regulations in 20 NMAC 4.1, authorize the use of AK in appropriate circumstances by waste generators or treatment, storage, or disposal facilities to characterize hazardous waste. AK is described in *Waste Analysis at Facilities that Generate, Treat, Store and Dispose of Hazardous Waste: A Guidance Manual* (EPA 1994a). AK, as an alternative to waste sampling and analysis, is used to meet all or part of RCRA waste characterization requirements (EPA 1994a).

AK includes a number of techniques used to characterize TRU waste, such as process knowledge, records of analysis acquired prior to RCRA, and other supplemental sampling and analysis data (EPA 1994a). VE, radiography, headspace gas sampling and analysis, and homogeneous waste sampling and analysis are used to acquire supplemental sampling and analysis data to meet the requirements of the WAP. AK is used in TRU waste characterization activities in three ways:

- To delineate TRU waste streams
- To assess whether TRU heterogeneous debris wastes exhibit a toxicity characteristic (20 NMAC 4.1.200 , incorporating 40 CFR 261.24)
- To assess whether TRU wastes are listed wastes (20 NMAC 4.1.200, incorporating 40 CFR 261.31)

AK is used to assign waste matrix codes and hazardous waste codes to waste streams and to determine the physical form of waste (waste material parameter) and radionuclides present in the waste.

Sampling and analysis are performed to confirm AK and to update and modify initial AK assessments. Sampling and analysis includes VE, radiography, headspace gas, and homogeneous waste sampling and analysis. TRU waste streams undergo applicable provisions of the AK process prior to shipment of the waste to WIPP.

B4-2 Acceptable Knowledge Documentation

The CCP collects and compiles, in a logical sequence, AK information that progresses from general facility information (TRU waste management program information) to more detailed waste-specific information (TRU waste stream information).

The CCP assesses information for each waste stream using CCP-TP-005, *CCP Acceptable Knowledge Documentation*. The AK information is then compiled into the AK report (and supporting documentation), as shown in Figure B4-1, Compilation of Acceptable Knowledge Documentation.

The following sections include the information the Permittee will require for the CCP to characterize TRU waste using AK. If the required information is not available for a particular waste, supplemental AK information is obtained and the waste is not shipped to the WIPP as a retrievably stored waste (i.e., the waste will be characterized as specified in Section B-3d(i)). All AK information obtained using CCP-TP-005, *CCP Acceptable Knowledge Documentation* is traceable from source documents to individual waste streams and waste containers.

B4-2a Required TRU Waste Management Program Information

TRU waste management program information clearly defines waste categorization schemes and terminology, provides a breakdown of the types and quantities of TRU waste that are generated/stored by the site (and processed by the CCP), and describes how waste is tracked and stored, including historical and current operations. Information related to TRU waste certification procedures and the types of documentation (e.g., WSPFs) used to summarize AK are also required.

The following information is included as part of the AK written record:

- A map of the site with the areas and facilities involved in TRU waste generation, treatment, and storage identified
- Facility mission description as related to TRU waste generation and management
- Description of the operations that generate TRU waste at the site
- Description of waste identification and characterization schemes used at the site or facility (e.g., content codes, item description codes)
- Types and quantities of TRU waste generated, including historical generation through future projections. Includes time and facility/site of generation
- Description of correlation of waste streams generated from the same building and process (e.g., sludge, combustibles, metals, and glass)
- Waste certification procedures for TRU wastes to be shipped to the WIPP

B4-2b Required TRU Waste Stream Information

The CCP uses AK to delineate waste streams for shipment to the WIPP. The available process information and data that supports the AK used to characterize waste streams are compiled in AK summary reports and supporting documentation in accordance with CCP-TP-005, *CCP Acceptable Knowledge Documentation*. The type and quantity of

supporting documentation may vary by waste stream, depending on the waste-generating process and site specific requirements imposed by the Permittee. At a minimum, the waste process information on each waste stream includes the following written information:

- Waste stream designation, including physical waste form assigned as Summary Category Groups and waste matrix codes
- Areas and buildings from which the waste stream was or is generated
- The waste stream volume and time period of waste generation
- Waste generating process described for each building (e.g., batch waste stream generated during decommissioning operations of glove boxes)
- Process flow diagrams. In the event that a process flow diagram cannot be created, a description of the waste generating process, rather than a formal process flow diagram, is used to satisfy this requirement. The use of the waste generating process description is justified, and the justification is placed in the AK record
- Material inputs that identify the chemical content of the waste stream and physical waste form (e.g., the waste material parameters)
- State and hazardous waste constituents and corresponding EPA or state Hazardous Waste Codes

The AK written record includes a summary that identifies all sources of waste characterization information used to delineate the waste stream. The basis and rationale for delineating each waste stream, based on the parameters of interest, is clearly summarized and traceable to referenced documents. Assumptions made in delineating each waste stream also are identified and justified. If discrepancies regarding the waste stream hazardous waste content exist among required information sources, then the CCP applies all appropriate Hazardous Waste Codes indicated by the information to the subject waste stream unless it can justify an alternative assignment and documents the justification in the AK record.

Implementing procedures listed in Section B4-3b address the following AK processes:

- Identifying and assigning the physical waste form of the waste
- Delineating waste streams and assigning Summary Category Groups and waste matrix codes
- Resolving inconsistencies in AK documentation

- Confirming AK information through headspace gas sampling and analysis, radiography, VE, and homogeneous waste sampling and analysis

- Describing management controls used to ensure prohibited items (specified in Section B) are documented and managed

- Ensuring that radiography/VE activities are conducted using a list of prohibited items that the operator verifies are not present in each container of waste (e.g., liquids exceeding WAC limits [DOE 1999b], corrosives, ignitables, reactives, and incompatible wastes)

- Documenting how changes to waste matrix code, waste stream assignment, and associated Hazardous Waste Codes based on material composition are documented for any waste

- Describing how AK is confirmed for newly generated waste using VE

B4-2c Supplemental Acceptable Knowledge Information

Site-specific supplemental AK information is collected as necessary to support required TRU waste stream information in accordance with CCP-TP-005, *CCP Acceptable Knowledge Documentation*. Available supplemental information is included in the AK written record. Supplemental AK documentation that may be used in addition to the information specified above includes, but is not limited to, the following information:

- Process design documents (e.g., Title II Design)

- Standard operating procedures that may include descriptions of processes that generate waste, lists of raw materials or reagents, etc.

- Preliminary and final safety analysis reports and technical safety requirements

- Waste packaging logs

- Test plans or research project reports that describe reagents and other raw materials used in experiments

- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements)

- Information from site personnel (e.g., documented interviews)

- Standard industry documents (e.g., vendor information)

- Analytical data relevant to the waste stream, including results from fingerprint analyses, spot checks, or routine verification sampling. This may also include new information acquired apart from the confirmatory process that supplements required information (e.g., VE not performed in compliance the WAP (NMED, 1999)

- Material Safety Data Sheet, product labels, or other product package information

- Sampling and analysis data from comparable or surrogate waste streams (e.g., residues, equivalent nonradioactive materials)

- Laboratory notebooks that detail the research processes and raw materials used in an experiment

All specific, relevant supplemental AK documentation assembled and used in the AK process, whether it supports or contradicts any required AK documentation, is identified and an explanation provided for its use (e.g., identification of a toxicity characteristic). Supplemental documentation may be used to further document the rationale for the hazardous characterization results. Similar to required information, if discrepancies exist between supplemental information and required information, then the CCP applies all Hazardous Waste Codes indicated by the supplemental information unless it justifies and documents in the AK record an alternative assignment.

B4-3 Acceptable Knowledge Training, Procedures, and Other Requirements

The CCP uses a three-phase process to characterize TRU waste by means of AK information: 1) compiling the required and supplemental AK documentation in an auditable record, as described in Sections B4-2 and B4-3b; 2) confirming and updating AK information using radiography and/or VE, headspace gas sampling and analysis, and solidified homogeneous waste sampling and analysis in accordance with Section B4-3d; and 3) auditing AK records.

B4-3a Qualifications and Training Requirements

The CCP and site personnel responsible for compiling AK, assessing AK, and resolving discrepancies associated with AK are qualified and trained in the following areas, at a minimum:

- WAP and TSDF-WAC requirements;

- State and Federal RCRA regulations associated with solid and hazardous waste determinations;

- Discrepancy resolution and reporting; and

- CCP and site-specific procedures associated with waste characterization using AK.

Position-specific qualification and training requirements such as those listed above for functional positions within the CCP are established by the SPM and documented in accordance with the CCP-QP-002, *CCP Training and Qualification Plan*. The SPM ensures that personnel conducting AK activities are qualified and trained as specified.

B4-3b Acceptable Knowledge Assembly, Compilation, and Confirmation Procedures and Required Administrative Controls

The CCP procedure, CCP-TP-005, *CCP Acceptable Knowledge Documentation*, allows for the consistent application of the AK process and requirements, and addresses the following requirements:

- The specific methodology used to compile AK records, including the origin of the documentation, how it is used, and any limitations associated with the information (e.g., identify the purpose and scope of a study that included limited sampling and analysis data)

- Written procedures to compile the required AK record

- Written procedures ensuring that unacceptable wastes (e.g., reactive, ignitable, corrosive) are identified and segregated from TRU waste populations sent to the WIPP

- Procedures to evaluate AK and resolve discrepancies. If different sources of information indicate hazardous wastes are present in a waste stream, the CCP includes all sources of information in its records and conservatively assigns all potential Hazardous Waste Codes unless it chooses to justify an alternative assignment and documents the justification in an auditable record. The assignment of Hazardous Waste Codes is traceable in the AK record to required documentation

- Procedures to identify hazardous wastes and assign the appropriate Hazardous Waste Codes to each waste stream in accordance with the following minimum baseline requirements:

  - Ensuring comparable and consistent characterization of hazardous waste

  - Compiling all of the required information in the AK record

- Reviewing the required information to determine whether the waste is listed under 20.4.1.200 NMAC (incorporating 40 CFR 261), Subpart D. Assigning all the Hazardous Waste Codes unless the CCP chooses to justify an alternative assignment and documents the justification in an auditable record

- Reviewing the required information to determine if the waste contains toxicity characteristic hazardous constituents specified in 20.4.1.200 NMAC (incorporating 40 CFR 261), Subpart C. If a toxicity characteristic contaminant is identified and is not included as a listed waste, assign the toxicity characteristic code unless data are available that demonstrate that its concentration in the waste is less than the toxicity characteristic regulatory level. When data are not available, the toxicity characteristic Hazardous Waste Code for the identified hazardous constituent is applied to the waste stream

- For newly generated wastes, procedures are developed and implemented to characterize hazardous waste using AK prior to packaging the waste

- Procedures to confirm AK in accordance with Section B4-3d

- Procedures that cross-reference waste streams to applicable waste Summary Category Groups to verify that all of the required confirmation data have been evaluated and Hazardous Waste Codes are properly assigned

- The CCP ensures that results of other audits of the CCP TRU waste characterization activities are available in the CCP files

The CCP requires the implementation of procedure(s) which specify administrative controls to ensure that prohibited items are documented and managed in accordance with certification procedures. The following minimum elements are addressed in documentation associated with administrative controls:

- Identifying the organization(s) responsible for compliance with administrative controls

- Identifying oversight procedures and frequency of actions to verify compliance with administrative controls

- Developing on-the-job training specific to administrative control procedures

- Ensuring that personnel may stop work if noncompliance with administrative controls is identified

- Developing a nonconformance process that complies with the requirements in Section B3 to document and establish corrective actions

- Assessing the potential time frame of the noncompliance, the potentially affected waste population(s), and the reassessment and recertification of those wastes

Procedures Used to Assemble the Acceptable Knowledge Record

The specific methodology used to assemble AK records, including the origin of the documentation, how it is used, and any limitations associated with the information is described in the CCP-TP-005, *CCP Acceptable Knowledge Documentation*.
This procedure provides instructions for compiling and reviewing AK source information, as well as ensuring that AK determinations are based on and traceable to the source documentation.

AK source information is collected and reviewed using an AK Source Document Summary form (CCP-TP-005, *CCP Acceptable Knowledge Documentation*), which categorizes, summarizes, and documents the utility and limitations of the AK source. The resulting data are compiled in the CCP TRU Waste AK Description documents within the AK summary report. A form is completed for each AK source.

Procedures Used to Ensure Unacceptable Waste is Identified and Segregated

Written procedures that meet the requirements of Section B-1c for ensuring that unacceptable wastes are identified and segregated from TRU waste to be shipped to the WIPP are as follows:

- CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*, which describes how VE is conducted on a statistically selected sample of retrievably stored containers to verify that nonconforming or prohibited items are not present

- CCP-TP-030, *CCP WWIS Data Entry and TRU Waste Certification* , which describes procedures for WWIS data entry and certifying that waste containers to be shipped to the WIPP meet the requirements of the WAP

- CCP-QP-005, *CCP Nonconforming Item Reporting and Control*, which describes the methods to identify, control, and dispose of nonconforming items. The procedure assigns responsibilities to identify, report, control, and evaluate nonconformances including those that affect compliance with the WAP.

- CCP-TP-005, *CCP Acceptable Knowledge Documentation*, which describes how AK is confirmed through 1) the VE of newly generated and other waste during packaging in accordance with procedures, and 2) evaluation of the WAP-required AK waste characterization data

Procedures Used to Evaluate Acceptable Knowledge, Resolve Discrepancies, and Assign Hazardous Waste Codes

The methods used by the CCP to evaluate AK and resolve and document discrepancies, assign Hazardous Waste Codes, and prepare a record of required documentation are described in the CCP-TP-005, *CCP Acceptable Knowledge Documentation*.
This procedure addresses the resolution of discrepancies among AK source documents and between AK and analytical data supplied by confirmation activities. The procedure also describes the process used to document the re-evaluation of AK if VE identifies wastes that must be assigned a different waste matrix code.

Resolution of discrepancies is documented in a discrepancy report (CCP-TP-005, *CCP Acceptable Knowledge Documentation*) that is maintained as a source document in the AK record. If discrepancies are identified in AK source documentation, the inconsistencies are resolved using supplemental information from interviews, phone contacts, or other correspondence. If the discrepancy cannot be resolved, the discrepancy report reflects this and all necessary information. If discrepancies exist between required information, then the CCP applies all Hazardous Waste Codes indicated by the information to the subject waste stream. Alternatively, the CCP may choose to justify an alternative assignment and document the justification in the AK record. Discrepancies are resolved prior to shipping waste to the WIPP.

Procedures Used to Identify Hazardous Waste

Written procedures to identify hazardous wastes and assign the appropriate Hazardous Waste Codes to each waste stream are described in CCP-TP-005, *CCP Acceptable Knowledge Documentation* and CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*.

Procedures Used to Confirm and Re-Evaluate Acceptable Knowledge

Written procedures for the confirmation of AK in accordance with Section B4-3d include the following:

- CCP-TP-005, *CCP Acceptable Knowledge Documentation*: This document describes the use of an AK confirmation checklist and contains an AK and waste characterization information cross-reference to ensure that corresponding AK and waste characterization data are consistent

- CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*: Following this procedure ensures that AK determinations are based on and traceable to source documentation

Written procedures that are used when the waste must be re-assigned (e.g., changes to waste matrix codes, waste steam assignment, Hazardous Waste Codes, etc.) include the following:

- CCP-TP-005, *CCP Acceptable Knowledge Documentation*: This procedure addresses the resolution of information discrepancies identified through either confirmation activities or assessment activities. The procedure also describes the process used to document the re-evaluation of AK if VE identifies wastes that must be assigned to a different waste matrix code

- CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*: This procedure describes calculation of the miscertification rate and the selection of waste containers for VE to confirm previous radiography results. It also triggers AK re-evaluation when analytical results require addition of Hazardous Waste Codes not previously assigned to waste streams

Procedures Used to Cross-Reference to the Applicable Waste Summary Category Group

The following written procedures provide cross-reference to the applicable waste Summary Category Group (i.e., S5000) to verify the required confirmation data has been evaluated and the proper Hazardous Waste Codes are assigned:

- CCP-TP-005, *CCP Acceptable Knowledge Documentation*: This procedure contains a current summary of the characterization of the TRU waste streams identified in AK waste stream summaries. It also procedure addresses changes to waste matrix codes, waste steam assignment, and any associated Hazardous Waste Codes. CCP-TP-005, *CCP Acceptable Knowledge Documentation* contains a form for AK and waste characterization information cross-reference

- CCP-TP-003, *CCP Sampling Design and Data Analysis for RCRA Characterization*: This procedure ensures that Summary Category Group designations based on AK are compared with VE and other data for consistency

Procedures Used for Administrative Control

The following administrative control minimum elements are addressed in written plans and procedures:

- The organizations responsible for compliance with administrative controls (including oversight and frequency of actions to verify compliance with administrative controls) are identified in Section A-4

- Develop OJT specific to administrative control procedures as described in CCP-QP-002, *CCP Training and Qualification Plan*

- Procedures under which personnel may stop work in case of a noncompliance with administrative controls are identified in CCP-QP-006, *CCP Corrective Action Reporting and Control*. This document describes the method to identify potential problems and conditions adverse to quality, and if necessary stop associated work. Requirements for the resolution and release of stop work orders are also defined

- As described in Section B3-13, a nonconformance process has been developed and is implemented in CCP-QP-005, *CCP Nonconforming Item Reporting and Control*. This process complies with the requirements in Section B3 to document the nonconformance and establish corrective actions

- As part of the corrective action process described in CCP-QP-006, *CCP Corrective Action Reporting and Control*, the potential time frame of each noncompliance is assessed, in addition to potentially affected waste populations. Waste stream reassessment or recertification based on AK is described in CCP-TP-005, *CCP Acceptable Knowledge Documentation*

B4-3c Criteria for Assembling an Acceptable Knowledge Record and Delineating the Waste Stream

CCP-TP-005, *CCP Acceptable Knowledge Documentation* describes the process for assembling AK documentation into an auditable record. The first step is to assemble the required AK information and any supplemental information regarding the materials and processes that generate a specific waste stream. CCP-TP-005, *CCP Acceptable Knowledge Documentation* establishes the process by which AK records are generated in compliance with the following criteria:

- AK information is compiled in an auditable record, including a road map for applicable information

- The overview of the facility and TRU waste management operations in the context of the facility's mission is correlated to specific waste stream information

- Correlations between waste streams, with regard to time of generation, waste generating processes, and site-specific facilities are described in the AK summary report (Section B4-2b). The rate (or schedule) and quantity of waste to be generated are also maintained in the AK process descriptions compiled in the AK summary report

- A reference list provided in Section B4-3b that identifies documents, databases, QA protocols, and other sources of information that support AK information

Container inventories are delineated into waste streams by correlating the container identifications to all of the required AK information and supplemental information in accordance with CCP-TP-005, *CCP Acceptable Knowledge Documentation*. The CCP assigns a waste matrix code and waste stream description to each container of waste using AK.

B4-3d Requirements for Confirmation of Acceptable Knowledge Information

AK includes information on the waste physical form, base materials composing the waste, and the waste generating process. Characterization of waste (i.e., radiography/VE, headspace gas sampling and analysis, and homogeneous sampling and analysis) is used to confirm AK information prior to waste shipment. AK characterization results are confirmed for both retrievably stored and newly generated waste. All retrievably stored TRU waste containers are sampled and analyzed for headspace gas and undergo either VE or radiography to confirm the waste matrix code and waste stream and certify compliance with the WAP. If retrievably stored waste must be repackaged then VE of the waste during repackaging, using the VE technique or VE in lieu of radiography, is used to confirm AK information. "CCP-TP-005, *CCP Acceptable Knowledge Documentation* describes the process the CCP uses to confirm AK for TRU waste.

For newly generated wastes, CCP written procedures document the confirmation of AK using VE prior to or during waste packaging. The procedures address the following minimum requirements:

- Scope (i.e., waste streams affected) and purpose;
- Responsible organizations;
- Administrative waste-generating process controls;
- Material inputs to processes;
- Process controls and range of operation that affect final hazardous waste characterization;
- Rate and quantity of hazardous waste generated;
- List of applicable operating procedures relevant to the hazardous waste characterization;
- Process knowledge verification sampling (i.e., headspace gas sampling); and
- Reporting and records management.

Re-Evaluation Based on Visual Examination and Radiography

The CCP has established procedures for reevaluating AK if VE or radiography results in the assignment of a different waste matrix code. The CCP procedures listed in Section B4-3d describe how waste AK is re-evaluated, the waste is reassigned, and appropriate Hazardous Waste Codes assigned. If a waste must be assigned to a different waste matrix code based on VE or radiography, the following minimum steps are taken to re-evaluate AK:

- Existing information is reviewed based on the container identification number and all differences in Hazardous Waste Code assignments are documented
- If differences exist between information obtained during VE or radiography and the Hazardous Waste Codes that were assigned based on sampling or AK, the information is reassessed, and required AK information associated with the new designation is documented
- Waste sampling and analytical data are reassessed and documented
- The reassignment of the waste matrix code is documented and verified (e.g., verification that the waste was generated within the specified time period, area, and building and waste generating process, and that the process material inputs are consistent with the waste material parameters of waste identified during VE or radiography)
- Changes to AK records are recorded per CCP-TP-005, *CCP Acceptable Knowledge Documentation*
- If discrepancies exist in the AK information for the reassigned waste matrix code, the discrepancies are documented in an NCR in accordance with CCP-QP-005, *CCP Nonconforming Item Reporting and Control*. The NCR documents the segregation of this container and defines the corrective actions necessary to fully characterize the waste

If the waste stream designation is so detailed that the specific components cannot be differentiated by radiography (e.g., a waste stream based on a specific type of plastic), the waste stream confirmation need not be performed and the omission is explained in the auditable record.

TRU Heterogeneous Debris

The base materials that compose TRU heterogeneous debris (S5000) waste (e.g., lead, stainless steel, glass) are well established and potential toxicity characteristic constituents can be determined without destructive sampling and analysis. The Summary Category Group, waste matrix code, and waste stream of the waste (waste material parameter) assigned for each container of waste using AK are based on the waste materials and the waste generating process.

In lieu of confirmatory sampling, analytical or other data to the contrary, the CCP assigns toxicity characteristic Hazardous Waste codes based on the presence of the constituent identified by AK regardless of the quantity or concentration. VE or radiography is used to confirm the waste matrix code and waste stream that were identified using AK. If the waste stream designation is so detailed that the specific components cannot be differentiated by radiography (e.g., a waste stream based on a specific type of plastic), this waste stream confirmation need not be performed, and the omission shall be explained in the auditable record. Procedures listed in Section B4-3b describe how discrepancies in the waste matrix code are recorded and additions to Hazardous Waste Codes based on material composition are documented.

Headspace Gas Sampling

Headspace gas sampling and analysis are conducted on all TRU waste or randomly-selected containers from waste streams that meet the conditions for reduced headspace gas sampling listed in Section B-3a(1) to be shipped to the WIPP. Headspace gas data are used to confirm the presence or absence of VOCs identified using AK.

The CCP utilizes AK to identify spent solvents associated with each TRU waste stream or waste stream lot. AK confirmation headspace gas sampling and analysis are performed, conducted, and reported in accordance with the applicable procedures.

Headspace gas data are used to confirm AK concerning the presence or absence of F-listed solvents and concentration of applicable toxicity characteristic solvents. The CCP confirms the assignment of F-listed Hazardous Waste Codes (20.4.1.200 NMAC, incorporating 40 CFR 261.31) by evaluating the average concentrations of each VOC detected in container headspace gas for each waste stream or waste stream lot using the UCL_{90}. The UCL_{90} for the mean concentration is compared to the PRQL for the constituent. If the UCL_{90} for the mean concentration exceeds the PRQL, the AK information is reevaluated and determine the potential source of the constituent.

Documentation is provided to support any determination that F-listed organic constituents are associated with packaging materials, radiolysis, or other uses not consistent with solvent use. If the source of the detected F-listed solvents cannot be identified, the

appropriate spent solvent Hazardous Waste Code is conservatively applied to the waste stream. In the case of applicable toxicity characteristic (D-listed) VOCs and non-toxic F003 constituents, the CCP may assess whether the headspace gas concentration renders the waste non-hazardous for those characteristics and change the initial AK determination accordingly.

Hazardous wastes associated with S3000 and S4000 waste streams will be verified based on the results of the total/TCLP analysis of a representative homogeneous waste sample. If discrepancies exist between the results obtained from solidified homogeneous waste sampling and analysis and headspace-gas sampling and analysis (i.e., a VOC is detected in the solidified waste but not in the headspace), the most conservative results will be used to verify AK and assign Hazardous Waste Codes, as applicable. As with headspace gas, if the total/TCLP results indicate that the concentration of a toxicity characteristic waste or non-toxic constituent of an F003 waste is below regulatory levels, the Hazardous Waste Code assigned initially by AK will be changed as part of the confirmatory process. Otherwise, if an F-listed waste constituent is detected, the appropriate Hazardous Waste Code will be applied.

If the confirmatory process determines that the source of the F-listed constituent is a spent solvent used in the process or is determined to be the result of mixing a listed waste with a solid waste during waste packaging, or applicable toxicity characteristic or non-toxic F003 wastes are present in excess of regulatory levels, then the CCP either: 1) assigns the applicable listed Hazardous Waste Code to the entire waste stream, or 2) segregates the drums containing detectable concentrations of the solvent into a separate waste stream and assign applicable Hazardous Waste Codes. The CCP documents, justifies, consistently delineates waste streams, and assigns Hazardous Waste Codes based on original site-specific permit requirements and other state-enforced agreements.

To determine the mean concentration of solvent VOCs, headspace gas data and solidified homogeneous waste data for a waste stream or lot will be used, including data qualified with a ‘J’ flag (i.e., less than the PRQL but greater than the MDL) or qualified with a ‘U’ flag (undetected). For data qualified with a ‘U’ flag, the CCP uses one-half the MDL to calculate the mean concentration (see Table B3-14). Because listed wastes are not defined based on concentration, the CCP does not remove Hazardous Waste Codes assigned using AK if hazardous constituents are not detected in the headspace gas or solids/soils analysis.

TRU waste headspace gas samples may contain one or two constituents at concentrations that are orders of magnitude higher than the other target analytes. In these cases, samples are diluted to remain within the instrument calibration range for the elevated constituents. Sample dilution results in elevated MDLs for the constituents with elevated concentrations. Only the concentrations of detected constituents are used to calculate the mean for the purpose of assigning F-listed Hazardous Waste Codes. Because the presence or absence of F-listed solvents cannot be confirmed based on the artificially high MDLs that are caused by sample dilution, data flagged as 'U' and showing an elevated MDL are not used in calculating the mean concentration.

B4-3e Acceptable Knowledge Data Quality Requirements

Data quality objectives for sampling and analysis techniques are described in Section B3. Analytical results are used to confirm the characterization of wastes based on AK. To ensure the process is consistently applied and ensure that AK information is accurate, complete, and is representative of the waste stream being evaluated, the CCP complies with the following data quality requirements:

- Precision - Precision is the agreement among a set of replicate measurements without assumption of the knowledge of a true value. The qualitative determinations, such as compiling and assessing AK documentation, do not lend themselves to statistical evaluations of precision. Therefore, precision requirements are not established for AK

- Accuracy - Accuracy is the degree of agreement between an observed sample result and the true value. The percentage of waste containers which require reassignment to a new waste matrix code and/or designation of different Hazardous Waste Codes based an the reevaluation of AK and/or and sampling and analysis data are reported as a measure of AK accuracy

- Completeness - Completeness is an assessment of the number of waste streams or number of samples collected to the number of samples determined to be useable through the data validation process. The AK record contains 100 percent of the information specified in Section B4-2. The usability of the AK information is assessed for completeness during audits

- Comparability - Data are considered comparable when one set of data can be compared to another set of data. Comparability is ensured through sites meeting the training requirements and complying with the minimum standards outlined for procedures that are used to implement the AK process. The CCP assigns Hazardous Waste Codes in accordance with Section B4-3b and provides this information regarding waste to other sites who store or generate a similar waste stream

- Representativeness - Representativeness expresses the degree to which sample data accurately and precisely represent characteristics of a population. Representativeness is a qualitative parameter that is satisfied by ensuring that the process of obtaining, evaluating, and documenting AK information is performed in accordance with the minimum standards established in Section B4-3b. The CCP also assesses and documents the limitations of the AK information used to assign Hazardous Waste Codes (e.g., purpose and scope of information, date of publication, type and extent to which waste parameters are addressed and limitations of information in identifying hazardous wastes)

The CCP addresses quality control by tracking its performance with regard to the use of AK by:

- Assessing the frequency of inconsistencies among information
- Documenting the results of AK confirmation through radiography or VE, headspace gas analysis, and solidified homogeneous waste analysis

In addition, the AK process and waste stream documentation is evaluated through internal assessments by the QA organization and assessment by auditors or observers external to the CCP (i.e., DOE-CBFO, NMED, EPA).

B4-3f Audits of Acceptable Knowledge

The Permittees conduct an initial audit of the CCP prior to certifying the CCP for shipment of waste to the WIPP. This audit establishes an approved baseline that is reassessed annually by the Permittees. The CCP does not certify waste for disposal until all corrective actions have been completed.

B4-4 Additional Final Confirmation of Acceptable Knowledge at the WIPP Facility

Confirmation of AK characterization designations is required prior to shipping waste, as stated in Section B4-3b. The CCP provides the required data associated with waste stream characterization, including the WSPF, WWIS data, and Characterization Information Summary, to the Permittee for review to ensure that characterization data confirm hazardous waste characterization made using AK. In addition, the CCP confirms that the assigned Hazardous Waste Codes for the waste stream are listed on the WSPF in accordance with the CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data* and agree with other characterization data. Hazardous Waste Code designation by AK is described in CCP-TP-005, *CCP Acceptable Knowledge Documentation*. The Permittees are provided with the WWIS data and associated Characterization Information Summary and reviews them to ensure that additions to Hazardous Waste Codes are identified and justified and that the Hazardous Waste Codes are included in the Part A of the WIPP HWFP (NMED, 1999).

As part of the reconciliation of DQOs described in Section B3-11, the CCP tracks and reports changes to hazardous waste characterizations. If data consistently indicate that discrepancies with AK information are identified (and were subsequently reconciled), the CCP implements appropriate corrective action, reassesses the materials and processes that generate the waste and resubmits waste stream profile information. If the Permittees' review of a WSPF and associated waste characterization data reveal nonconformance with AK requirements (i.e., project level nonconformance), the waste is not shipped to the WIPP facility until corrective actions are implemented and the WAP requirements met.

Repeated nonconformances by the CCP in implementing and documenting the WAP requirements will result in the termination of the Permittees management, storage, or disposal of its waste streams, or Summary Category Groups, as applicable. Management, storage, or disposal of the subject waste stream will not resume until the Permittees find that all corrective actions have been implemented and that the CCP complies with all applicable requirements of the WAP. Any drum with unresolved discrepancies associated with hazardous waste characterization will not be shipped to the WIPP until the discrepancies are resolved. All shipments of the subject waste stream will cease until the corrective action(s), as necessary, are implemented and the discrepancy(ies) resolved. The Permittees require the CCP to reassess the materials and processes that generate the waste, and headspace gas sampling and analysis, radiography or VE, and solidified homogeneous waste sampling and analysis results.

B5 QUALITY ASSURANCE PROJECT PLAN REQUIREMENTS

B5-1 Quality Assurance Project Plans

The CCP has developed and implemented this QAPjP to address the applicable waste characterization requirements specified in the WAP. This QAPjP includes the qualitative or quantitative criteria to ensure that waste characterization activities are being performed satisfactorily. The organization(s) and position(s) responsible for implementation of this QAPjP are identified in Section A-4. Throughout this QAPjP, CCP documents are referenced that detail how each of the required elements of the characterization project are performed.

This QAPjP follows the format of the WAP and is implemented by the CCP through procedures that address TRU waste characterization activities. Compliance with CCP documents ensures that tasks are performed in a consistent manner that results in achieving the quality required under the CCP QA program. The organization, format, content, and designation of the CCP procedures is described in the CCP-QP-010, *CCP Document Preparation and Approval* and CCP-QP-007, *CCP Document Control*.

B5-2 Document Review, Approval, and Control

Prior to the implementation of characterization activities, the SPM ensures that written procedures have been developed for implementing the requirements of this QAPjP. Procedures ensure that tasks are performed in a consistent manner and achieve the quality required for the quality assurance program. The SPM is responsible for ensuring that the procedures meet the organization, format, content, and designation of standard operating procedures described in CCP-QP-010, *CCP Document Preparation and Approval*. CCP procedures are written so that they may be implemented at several sites simultaneously. Site-specific issues such as safety policies, technical specification requirements, or organizational necessities, may require the CCP to prepare site-specific procedures to supplement the procedures used to ensure WAP compliance. These procedures are identified in the SOW or site interface document. These procedures are prepared and controlled as are the other existing CCP operating procedures and are subject to site specific review requirements as described in CCP-QP-010, *CCP Document Preparation and Approval*. As a minimum, the following requirements are addressed in CCP procedures:

- Responsibilities of the organizations affected by the document,
- Technical, regulatory, quality assurance, or other program requirements,
- Sequential description of work to be performed,
- Quantitative or qualitative acceptance criteria sufficient for determining that activities were satisfactorily accomplished,

- Prerequisites, limits, precautions, process parameters, and environmental conditions,
- Special qualifications and training requirements,
- Verification points and hold points,
- Methods for demonstrating that the work was performed as required (such as provisions for recording inspection and test results, checklists, or sign-off blocks), and
- Identification and classification of QA records to be generated by the implementing procedure.

Procedures also include examples of data (e.g., reports, forms, and data validation checklists), as appropriate. CCP-QP-007, *Document Control,* specifies internal review and approval requirements. In addition, CCP procedures are formatted as described in CCP-QP-010, CCP Document Preparation and Approval, as follows:

- Purpose
- Scope
- Requirements
- Responsibilities
- Procedures
- Records

CCP procedures are reviewed for consistency with the QAPjP in accordance with the above listed requirements. The SPM is responsible for ensuring that the most current version of all procedures is readily available for use as needed by project personnel after procedures have been reviewed and approved for use.

The SPM ensures that the preparation, issuance, and change to documents that specify quality requirements or prescribe activities affecting quality for the CCP program be controlled to assure that correct and current documents are used and referenced. The CCP uses a document control format consisting of a unique document identification number, current revision number, date, and page number, which will be placed in the header on the individual pages of the document. CCP documents are delineated into three areas: quality procedures, denoted by CCP-QA-XXX; technical procedures, denoted by CCP-TP-XXX; and site project office documents (i.e., this QAPjP), denoted by CCP-PO-XXX. “XXX” denotes a sequential number.

Qualified and independent personnel review all CCP documents (including this QAPjP) prior to approval and issuance. Reviews consider the technical adequacy, completeness, and correctness of CCP documents and the inclusion of and compliance with the requirements established by the WAP. Approval is indicated by a signature and date page included in the front of the document. The SPM ensures that:

- Revisions to site implementing documents are denoted by including the current revision number on the document title page, the revised signature page, and each page that has been revised

- Revised pages are marked in redline/strikeout for expeditious review of the entire document

- A vertical bar, indicating the change to the text, is included along the left-hand margin of the page, except in the case of full document revisions

- Revised document submittals identify the changes, the reason for the changes, and the justification for concluding that the revised contents continue to satisfy the requirements of the QA program

- Revisions that affect performance criteria or data quality (e.g., sampling or analytical methods, QAO, calibration requirements), other than editorial or minor changes undergo the same level of review and approval as the baseline version of each document. Editorial or minor changes are reviewed and approved by the same functional organizations that performed the original review/approval, unless other organizations are specifically designated in accordance with approved procedures. The following items are considered editorial or minor changes:

  - Correcting grammar or spelling (provided the meaning has not changed),

  - Renumbering sections or attachments,

  - Updating organizational titles *(A change in an organizational title accompanied by a change in responsibilities is not considered an editorial change)*,

  - Changes to non-quality-affecting schedules,

  - Revised or reformatted forms, providing the original intent is not altered, and

  - Attachments marked “Example” or exhibits clearly intended to be representative only

- CCP personnel are responsible for reporting any obsolete or superseded information to the SPM

- All CCP changes are evaluated and approved by the SPM and the SPQAO, the appropriate personnel are notified before implementation, and the affected documents are revised as necessary

- Changes that affect performance criteria or data quality, and would take the activity out of compliance because they alter a requirement are not made without prior approval by DOE CBFO

In addition, the SPM is responsible for ensuring that proposed changes to this QAPjP and other WAP-related plans and procedures are reported to the Permittees within five days of identification. The SPM ensures that the document control system described in CCP-QP-007, *CCP Document Control* is implemented to control the process for initiating, revising, modifying, reviewing, and distributing project documents and changes to project documents. As potential changes to project information are identified by the SPM, documents are revised as necessary and distributed to affected organizations in accordance with this procedure.

B6 PERMITTEE AUDIT AND SURVEILLANCE PROGRAM

B6-1 Introduction

The WIPP audit and surveillance program ensures that the CCP conducts sampling and analysis of wastes in accordance with the current WAP and that waste certification information is being managed properly. The CCP addresses deficiencies identified during the audits. A deficiency is any failure to comply with an applicable requirement of the WAP.

B6-2 Audit Procedures

This section does not apply to the CCP.

B6-3 Audit Position Functions

This section does not apply to the CCP.

B6-4 Audit Conduct

When a deficiency is identified by the CBFO audit team, a Corrective Action Report (CAR) is issued to the CCP. The CCP reviews the CAR which is used to evaluate the extent and cause of the deficiency, and submits an approved response to the Permittees indicating remedial actions taken to preclude recurrence. This is accomplished in accordance with CCP-QP-006, *CCP Corrective Action Reporting and Control*. If these responses to the CAR are acceptable, CBFO communicates the acceptance to the CCP.

The CCP completes the remedial actions and actions to preclude recurrence and requests CBFO to close the CAR. Following the completion of corrective actions, the Permittees may schedule and perform a verification visit to assure that corrective actions have been completed and are effective.

The corrective action response includes a discussion of the investigation performed to determine the extent and impact of the deficiency, a description of the remedial actions taken, determination of root cause, and action taken to preclude recurrence.

The CCP responds to any deficiencies and observations within thirty (30) days of receipt of any CARs and indicates the corrective action taken or to be taken. If the corrective action has not been completed, the response indicates the expected date the action will be completed. CARs applicable to WAP requirements are resolved prior to waste shipment.

REFERENCES

Hatayama, H.K., Chen, J.J., de Vera, E.R., Stephens, R.D., and Storm, D.L. 1980. "A Method for Determining the Compatibility of Hazardous Wastes," EPA-600/2-80-076. U.S. Environmental Protection Agency, Ohio.

Lockheed Idaho Technologies Company. 1995. "Position for Determining Gas Phase Volatile Organic Compound Concentrations in Transuranic Waste Containers," Idaho National Environmental Lab Report, INEL-95/0109/Revision 1. Lockheed Idaho Technologies Company, Idaho.

New Mexico Environment Department (NMED). 1999. *Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit*, #NM4890139088. New Mexico Environment Department, New Mexico.

National Archives and Records Administration. Title 40, Code of Federal Regulations, Protection of the Government. Washington, D.C.

General Services Purchasing Division. Title 20 New Mexico Administrative Code, Environmental Protection. Santa Fe, New Mexico.

United States Department of Energy (DOE). 1999a. *Quality Assurance Program Document*, DOE/CAO-94-1012. Carlsbad Field Office, U.S. Department of Energy, Carlsbad, New Mexico.

United States Department of Energy (DOE). 1999b. *Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, DOE/WIPP-069. Waste Isolation Pilot Plant, U.S. Department of Energy, Carlsbad, New Mexico.

United States Department of Energy (DOE). 1999d. *Safety Analysis Report for the TRUPACT-II Shipping Package,* NRC Docket Number 71-9218. Carlsbad Field Office, U.S. Department of Energy, Carlsbad, New Mexico.

United States Department of Energy (DOE). 2001. *WIPP WWIS User's Manual for Use by Shippers/Generators*, DOE/CAO-97-2273. Carlsbad Field Office, U.S. Department of Energy, Carlsbad, New Mexico.

United States Department of Energy (DOE). 2001a. *Performance Demonstration Program Plan for the Analysis of Simulated Headspace Gases for the TRU Waste Characterization Program*, DOE/CAO-95-1076. Carlsbad Field Office, U.S. Department of Energy, Carlsbad, New Mexico.

United States Department of Energy (DOE). 2001b. *Performance Demonstration Program Plan for RCRA Constituent Analysis of Solidified Wastes*, DOE/CAO-95-1077. Carlsbad Field Office, U.S. Department of Energy, Carlsbad, New Mexico.

United States Department of Energy (DOE). 1997b. *WIPP RCRA Part B Permit Application*, Revision 6, DOE/WIPP-91-005. Waste Isolation Pilot Plant, U.S. Department of Energy, Carlsbad, New Mexico.

United States Department of Energy (DOE). 1995. *Transuranic Waste Baseline Inventory Report*, DOE-CAO-95-1121. Carlsbad Field Office, U.S. Department of Energy, Carlsbad, New Mexico.

United States Environmental Protection Agency (EPA). 1988. "Compendium Method TO-14, Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas Chromatography," in *Compendium of Methods for the Determination of Toxic Organic Compounds on Ambient Air, Second Edition*. Center for Environmental Research Information, Office of Research and Development, U.S. Environmental Protection Agency.

United States Environmental Protection Agency (EPA), 1997 or latest update. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, EPA SW-846, United States Environmental Protection Agency.

United States Environmental Protection Agency (EPA). 1994a. *Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual*, #05-520. Office of Solid Waste and Emergency Response, United States Environmental Protection Agency.

United States Environmental Protection Agency (EPA). 1994b. *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*, EPA/540/R/94/082. United States Environmental Protection Agency.

United States Environmental Protection Agency (EPA). 1994c. *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, EPA/540/R/94/083. United States Environmental Protection Agency.

Westinghouse Savannah River Company (WSRC). 2000 or latest update. *Statement of Work IE8863 for Characterization of SRS TRU Waste.* Westinghouse Savannah River Company.

ACRONYMS AND ABBREVIATIONS

%	percent
AK	acceptable knowledge
ASTM	American Society for Testing and Materials
BDR	Batch Data Report
BS	bachelor of science
°C	degrees Celsius
CBFO	Carlsbad Field Office
cc/s	cubic centimeters per second
CCP	Central Characterization Project
CFR	Code of Federal Regulations
CH	contact handled
CT	computed tomography
%D	percent difference
DA	data administrator
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
DQO	data quality objective
DOT	U. S. Department of Transportation
EPA	U. S. Environmental Protection Agency
°F	degrees Fahrenheit
FRC	Federal Records Center
g	gram
gal	gallon (gal.)
GC/MS	gas chromatography/mass spectrometry
Hg	mercury
HPLC	high pressure liquid chromatography
HWDU	Hazardous Waste Disposal Unit
ID	identification
IDL	instrument detection limit
in.	inches
ITR	Independent Technical Reviewer
l	liter
LDR	Land Disposal Restrictions
LCS	laboratory control sample
MDL	method detection limit
ml	milliliter
mm	millimeter
mg/kg	milligram per kilogram
nCi	nanocuries
NCR	nonconformance report
NCT	National Certification Team
NDE	nondestructive examination
ng	nanogram
NIST	National Institute of Standards and Technology

NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
OJT	on-the-job training
OVA	organic vapor analyzer
PCB	polychlorinated biphenyls
PDP	Performance Demonstration Program
ppm	parts per million
ppmv	parts per million by volume
PRDL	program required detection limit
PRQL	program required quantitation limit
QA	quality assurance
QAO	quality assurance objective
QAPD	Quality Assurance Program Document
QAPjP	quality assurance project plan
QC	quality control
%R	percent recovery
RCRA	Resource Conservation and Recovery Act
RH	remote handled
RPD	relative percent difference
%RSD	percent relative standard deviation
RTL	regulatory threshold limit
SAR	Safety Analysis Report
SME	subject matter expert
SOW	Statement of Work
SPC	statistical process control
SPM	site project manager
SPQAO	site project quality assurance officer
SVOCs	semivolatile organic compounds
SW-846	U.S. EPA *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*
SWD	standard waste box
TAL	target analyte list
TCLP	toxicity characteristic leaching procedure
TCO	transportation certification official
TIC	tentatively identified compound
TRAMPAC	*TRUPACT-II Authorized Methods for Payload Control*
TRU	transuranic
TRUCON	*TRUPACT-II Content (Code)*
TRUPACT-II	Transuranic Package Transporter-II
TS	Technical Supervisor
TWBIR	*Transuranic Waste Baseline Inventory Report*
UCL_{90}	upper 90 percent confidence limit
UHWM	Uniform Hazardous Waste Manifest
VE	visual examination
VOC	volatile organic compound
WAC	(WIPP) Waste Acceptance Criteria
WAP	Waste Analysis Plan

WCO	waste certification official
WIPP	Waste Isolation Pilot Plant
WSPF	Waste Stream Profile Form
WSRC	Westinghouse Savannah River Company
WWIS	WIPP Waste Information System